THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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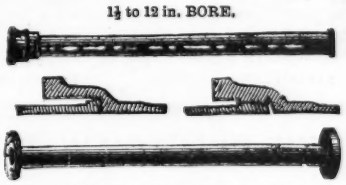

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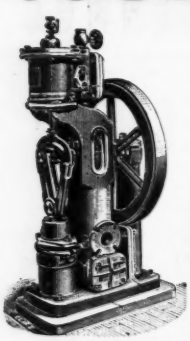

. 705. "SINGLE RAM" STEAM-PUMP.

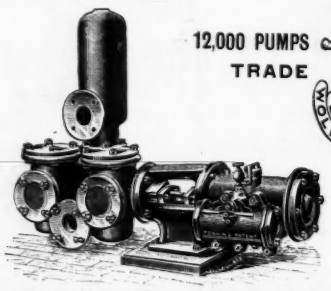

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

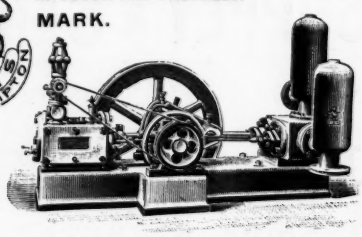

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

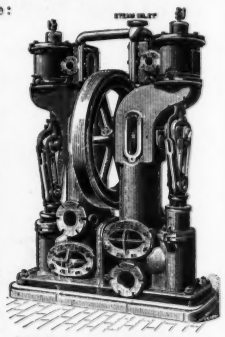

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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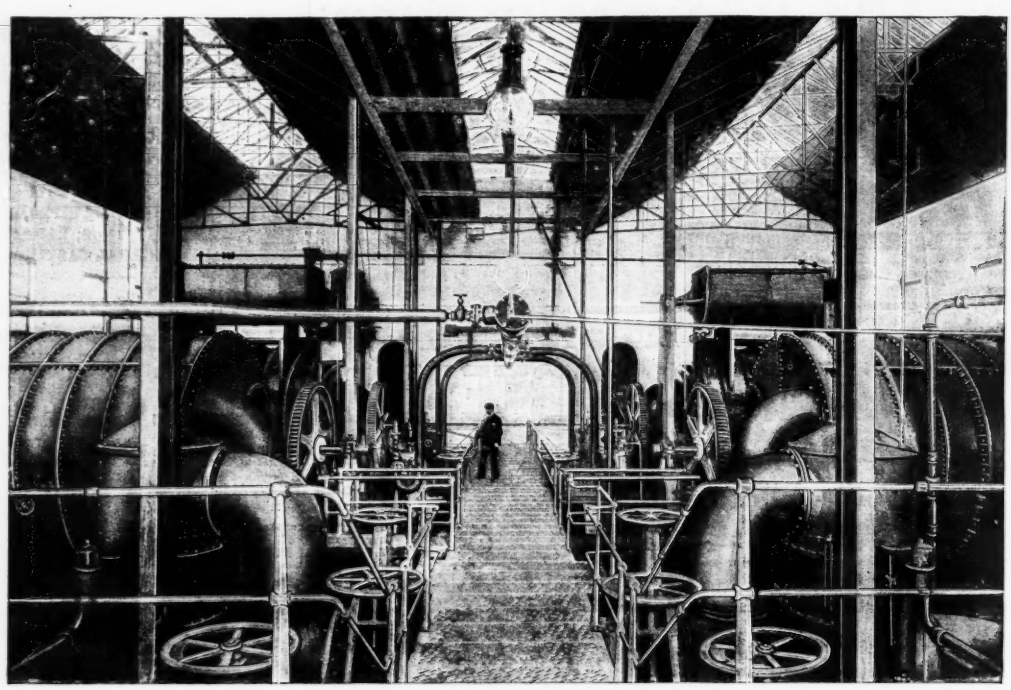

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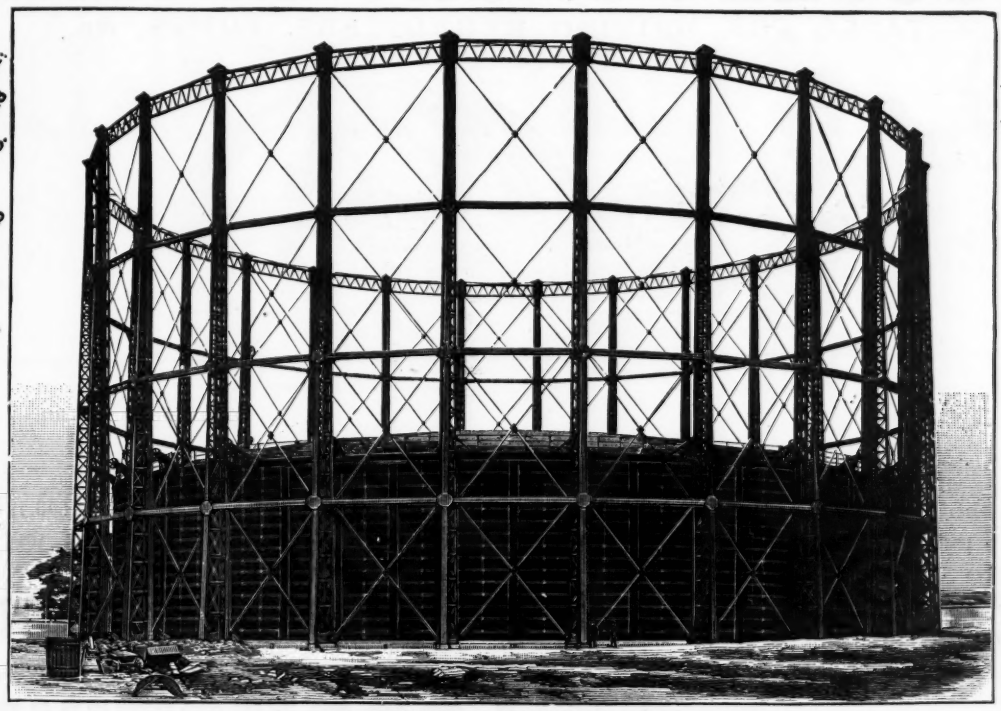

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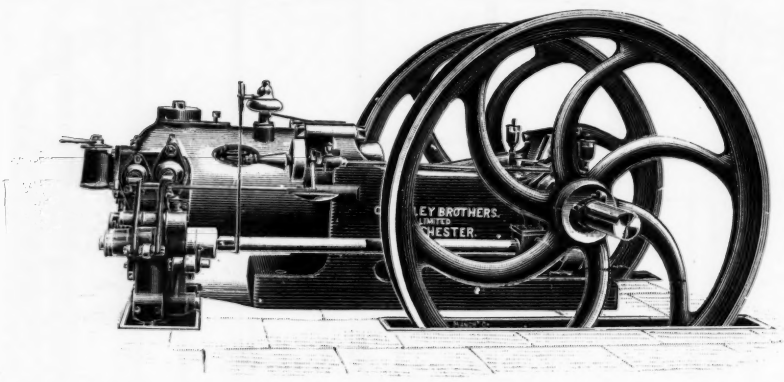

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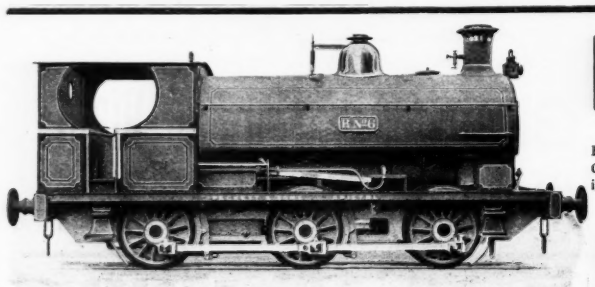

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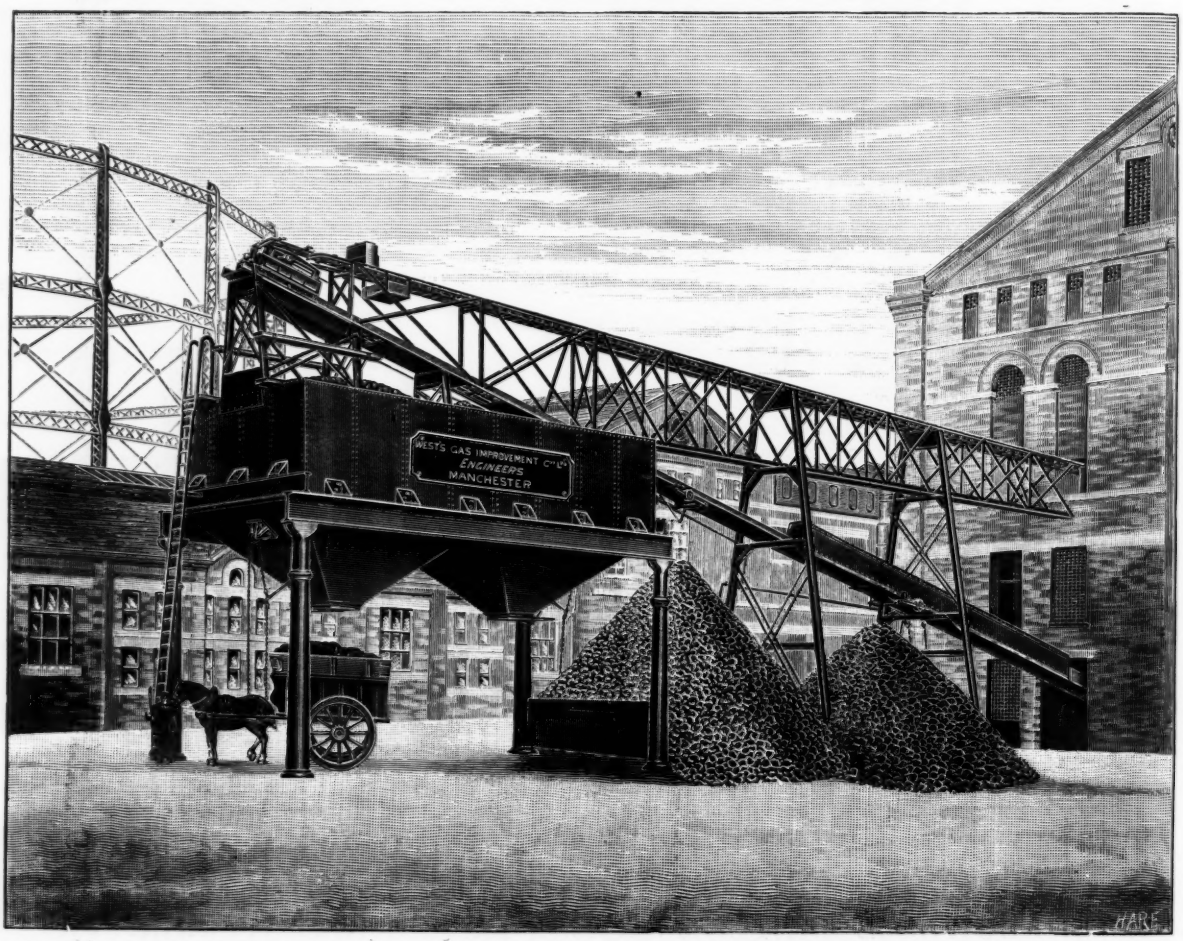

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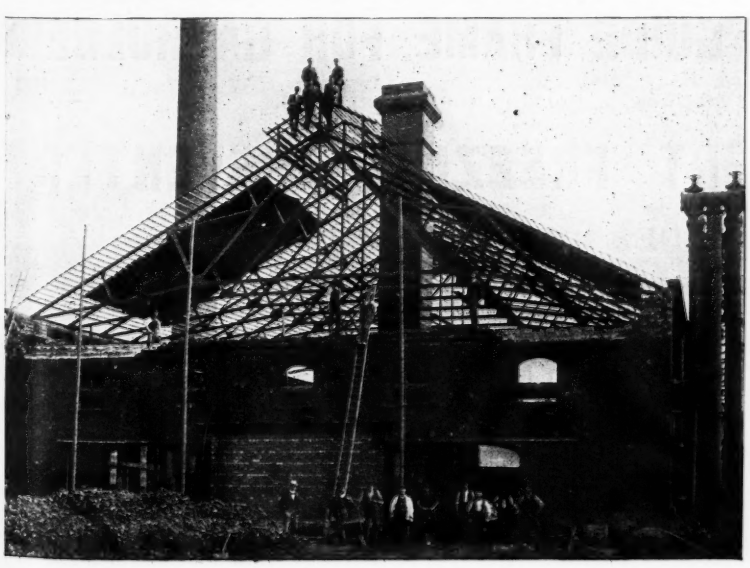

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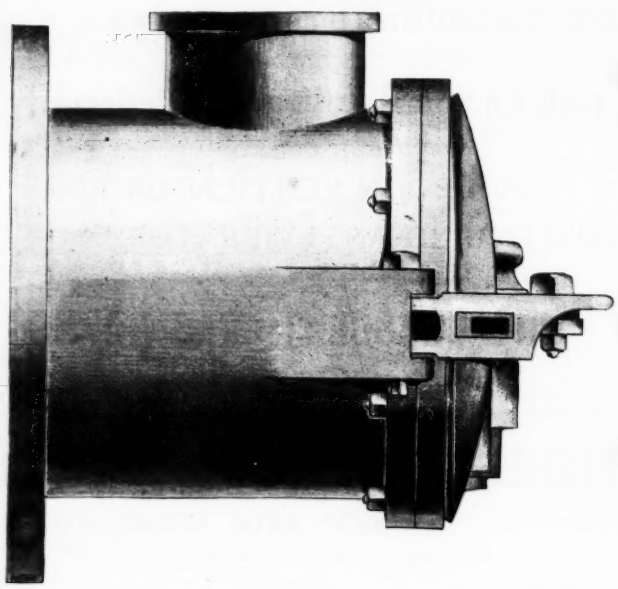

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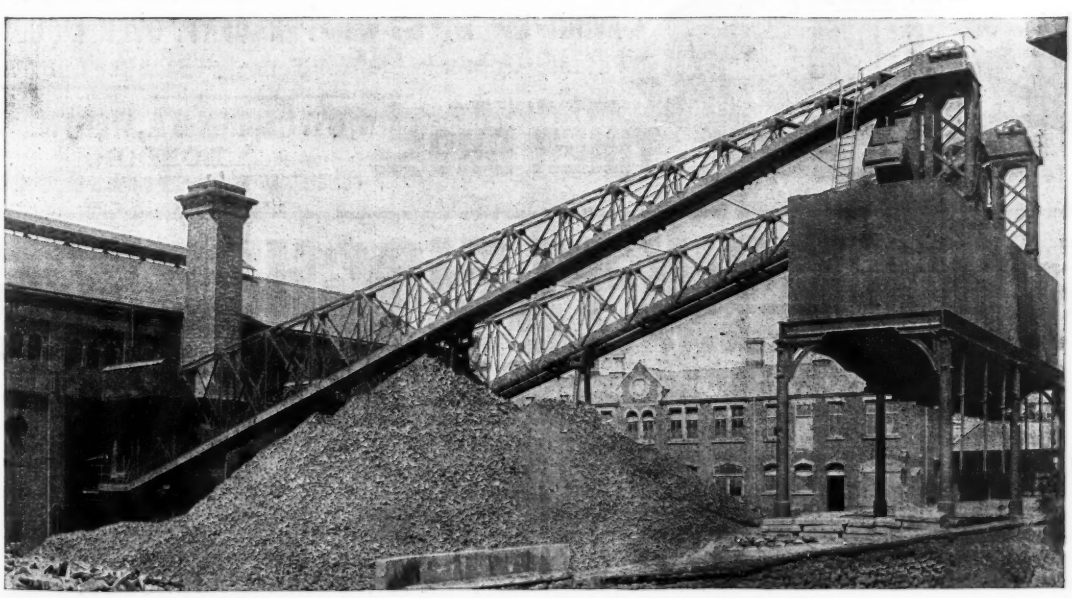

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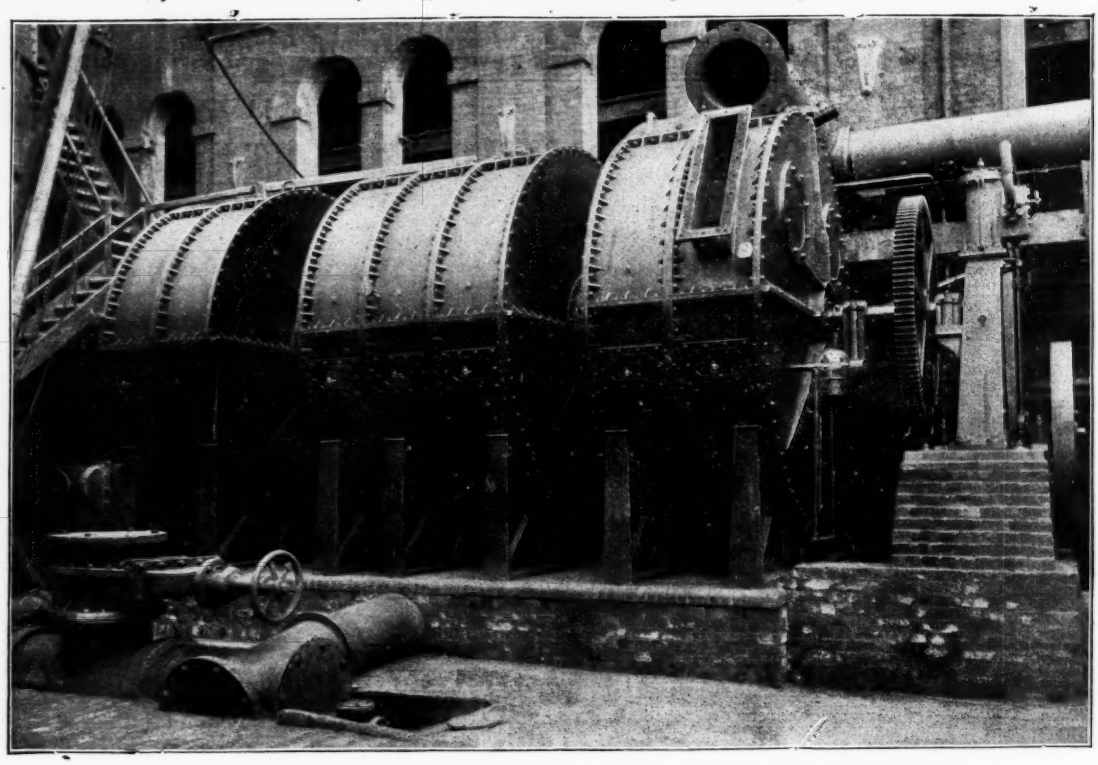

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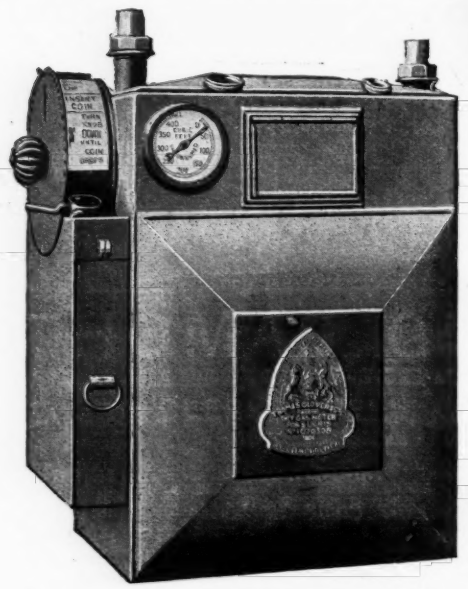

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See also Advt. on last White Page.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

The Wages and Responsibilities of Workpeople.

WE are all statisticians nowadays, and it is a remarkable coincidence that just as men of affairs have come to be of one mind on the point that figures can be made to prove anything, the importance of statistics, regarded as guides to the formation of judgment, has increased. Men trust figures less, perhaps, but use them more than ever. Nor is there any real contradiction in this attitude of the modern statesman and man of business towards statistical data. It merely means that the wise employment of figures, as well as of facts, is for the illustration and support of argument. Facts and figures are dead matter until the vivifying judgment has been applied to them, and they are made to stand up and march towards a determined conclusion. Of course, such an observation may mean sometimes that the same data will be used by different people in quite opposite senses; but this cannot be helped. Critical independent judgment of the different applications will usually indicate which is the more credible one. Some orders of figures, however, are so confused and confusing, that it is almost impossible to use them intelligibly to inform opinion. Of such are the data relating to the hours of labour and comparative conditions of workpeople in different ages and countries, and also at different epochs in the same industry and country.

The announcement made the other day that the Town Council of West Ham had, by a large majority, resolved to abolish the eight-hour day, or 48-hour week, for their workpeople, must have aroused some memories and suggested several pertinent reflections in the minds of those employers of labour who had to deal with this point of the Charter of New Unionism in 1898. Nothing can more forcibly demonstrate the artificiality of that movement, and of the false pretence on which the Manns and Michael Henrys of the period rested their demand for a universal eight-hour day, than the fact that, after about four years' trial, the most democratic of the Metropolitan Suburban Corporations—a Corporation with Beckton and Woolwich Arsenal to take example from—has not only found out its hollowness, but has been able to give it up. The latter is by far the more impressive lesson. For if there had remained any "kick" in the Trade Unions which stand committed to the eight-hour day principle, though a public body might have had ample reason for desiring to put a stop to it, no attempt in this direction could have been made. One can only conclude from this striking phenomenon of direct municipal employment at the present day, that the principle in question is as dead and gone as Julius Cæsar.

It would be a most desirable consummation if the same revulsion of opinion that has been so strikingly manifested in the Corporation of West Ham were to spread generally, and have the effect of reviving a healthier view of the responsibility towards their workpeople and towards the community, of those non-competitive traders and employers who were led away by the other New Unionist fallacy about it being their duty to be "model employers." Of course, in a sense, every employer ought to be a model of justice and of mercifulness to his workpeople; but as the professional New Unionists understood this requirement, it meant that the Government in the case of the arsenals and dockyards, Municipalities in regard to their departments, and Gas and Water Companies enjoying protected dividends, should pay higher wages and expect less in return from their hands than employers engaged in competitive business. The latter were dealt with in another way. It has now transpired that at West Ham, for one place where the meat is pretty close to the bone for everybody, and the rates are (under the old system) 10s. in the pound, the "model employer" principle has broken down.

Certain Progressive newspapers profess natural regret, and shed the tear of sensibility over the "backward step" taken by the Corporation in the direction of fairness to the ratepayers and to other employers of labour in the borough. It is easy to be generous at other people's expense; and the perfunctory lamentations of a few time-serving politicians and journalists will not affect the evident determination of the West Ham Town Council to get more value for the public money spent in wages. Their experience has been that model employment did not evoke model service. The effect of the principle was to create a "most-favoured" class of workpeople, who never deemed it incumbent upon themselves to justify a preferential treatment in the Corporation employ which they certainly could not get outside. Thousands of people in the borough were working sixteen hours a day to earn the money required to pay these pampered loafers for dawdling through their eight hours; and it is no wonder that the Corporation decided that they could not carry on the imposture any longer. It was stated by somebody, in the course of the debate, that the men did more in eight hours than they formerly did in nine or ten. One has heard this fairy tale before; and the only proper comment upon it is that it is not true. It was asserted publicly a few days ago, and not denied, that there is a street corner in the North of London where, on opposite sides of the road, similar blocks of buildings are being erected—one by a private firm of builders, and the other by men in the employ of the London County Council. Both were started at the same time; but the municipalized gentlemen had only got above the footings when the builders' men over the way were at the third storey. Every Gas Company in London knows what "direct employment" means in the matter of street works.

It is not fair that industrial undertakings and commercial firms with a living to make, and bankruptcy before their eyes if they fail to do so, should be placed under the disability to deal with the labour question in their own way which these model employers create for them. We say nothing for the present about the "fair wages clause" in contracts, which is another scandal. There are many ways in which all kinds of employers can easily adopt "model" methods of treating their men, not merely without causing injury to any other people, but to the considerable benefit of the men themselves. Now, one of these expedients is the stamping-out of time-losing habits, which are among the greatest curses of the British workman's life. It is gratifying to observe that Sir W. T. Lewis, and some other large employers of colliery labour in South Wales, have recently taken what looks very much like concerted action to deal with the nuisance of wilful stoppages. The colliers have always acted as though they had a right to stay away from their work at will; and they have done so whenever the whim seized them, on any trivial excuse or none. The question of the legal aspect of some of these "stop days" has been discussed in the "JOURNAL." But what the colliery owners complain of is the perpetually occurring abstentions which cause so much loss and annoyance, which nobody outside ever hears about. A week or so ago, the men employed at some of Lord Bute's pits ceased working, as a measure for compelling a small non-Union minority to join the Union. When this effect had been produced, the men sent a deputation to Sir W. T. Lewis, to inform him that it was their pleasure to resume their customary labours. The reply was returned that they could not be taken back until compensation had been paid for the damage done to Lord Bute's property by the stoppage.

This return of a "Roland for their Oliver" disconcerted the deputation, who begged to be allowed to restart "now "that they were all Unionists." Seeing what had occurred, this was about as cool a plea for mercy as that of the traditional parricide who asked to be pardoned because he was an orphan. It appears to have aroused Sir William's righteous indignation, for he stigmatized the men's conduct as disgraceful, amounting as it had done to an attempt to starve their fellows into joining the Federation, whereas he had always strongly forbidden coercion of this description, and showed no difference between Union and non-Union men. He then dismissed the deputation to devise some means of

compensating Lord Bute for the loss they admitted had been caused by the stoppage. At Nixon's Navigation Collieries, the men who presented themselves for work after they had stayed away as long as they pleased, were sent back for another week to please the management. If employers in general will proceed upon these lines, and insist upon both workmen and Trade Unions bearing the full responsibility for their actions, the condition of the working classes of this country will be enormously raised without statistics or other formal records showing a sign of the benefit.

The Abstracts of Gas Acts for 1903.

THE abstracts of the Gas Acts of the past session of Parliament, which were completed in last Tuesday's "JOURNAL," give a general view of contemporary parliamentary practice not otherwise obtainable. The character of the financial arrangements entered into by the different Companies is a good indication of the standing of the English gas industry. Stock consolidations and conversions upon the 5 per cent. basis are pretty general. There is still some diversity of practice in regard to the proportion of loan capital, though no difficulty exists in making it as much as one-third of the nominal amount of stock after conversion. Several Companies have given their adhesion to the plan of affording their consumers and employees an opportunity for acquiring stock; and it is sincerely to be hoped that the provision will not be allowed to remain a dead-letter in these cases. As events have recently turned out, a 5 per cent. stock is the minimum that can be depended upon to keep above par, in the case of small or remote gas undertakings. The movement in favour of reducing the standard illuminating power of gas to 14 candles, tested in the manner most favourable to the gas, has been strengthened by the addition of some notable instances. It may be as well to observe, however, that this advantage is not exactly to be had everywhere for the asking as a matter of course. The Act of the Commercial Gas Company is sufficient indication that the industry is not quite "out of the wood" in this respect.

The addition of a neutral zone to the sliding-scale is a device which seems to be growing in favour. This is quite reasonable, as it removes a certain stumbling-block to the fixing of a standard price. The usual string of new, or comparatively novel, clauses appears to go down very well; and it cannot be doubted that Companies possessed of these facilities for doing business must find it much easier to get along than those with fewer privileges. The only positive drawback to a new Act from the Gas Companies' point of view, is the appearance in the text of the ridiculous clause forbidding the taking of more than a certain number of houses "occupied by the labouring class." It is a very petty sort of class legislation that does no credit to Parliament. Of course, it comes from Railway Acts, in respect to which it is likely to be more operative; but even so, the restriction is pretty certain, wherever it comes into force, to do more harm than good. In face of recent developments in the electric lighting trade, Gas Companies will be well advised to get all the powers they can properly desire or obtain for satisfying their consumers.

The subject of consumers' discounts is left very open in this year's Acts. Some of the enactments permit a good deal of latitude to the Companies in this regard, which is a step in the right direction. At the same time, it is difficult to see the soundness of allowing too big a discount for prompt payment. A sufficient discount to encourage large consumption, or the most desirable class of consumption, is doubtless a good thing for business. The denial to Gas Companies of permission to manufacture consumers' fittings ought to be a source of great gratification to "the trade;" but its practical effect is not noticeable in the majority of instances. Of course, the restriction appears in Gas Companies' Acts merely because it was considered a reasonable curb on municipal trading, and it was deemed impracticable to serve Companies and Corporations differently in this respect. All the same, it is not a disability that a large Gas Company ought to submit to willingly, by reason of the possible machinations of associated manufacturers to run up prices. The existence in some Acts of sanction to form a renewal fund of limited amount, is a consideration that should appeal to many gas-works administrators. It regularizes the making of a provision to which not all gas directors have given proper attention.

Rumoured Legislation for Next Session.

IT was rumoured on Saturday that one of the legislative proposals of the Government for the ensuing session is to be the extension of the Workmen's Compensation Act to all the employments now exempted from its operation. This is probably an intelligent anticipation of events; for it has been known all along that such an extension would be made in due course. Incidentally, the report discountenances the idea that the Government intend to appeal to the country before the ordinary close of another session. This should help to reassure those intending promoters of Private Bills who may have been half afraid to go on this November, lest there should be a Dissolution. The extension of the Workmen's Compensation Act to all persons employed by other people for wages, or an equivalent, appears on the surface a simple proposition, and doubtless it could be effected in a single clause by a master in the art of drafting. Yet there would remain the real difficulty, which is that of the definition of a workman or servant, including seafaring persons. Whenever the amending Act is passed, there will be bustle in the insurance world; for nothing short of a universal system of providing against the risk will suffice to reassure the employer, say, of one small servant who might at any moment burn her fingers at the gas-stove and require to be compensated for the injury. Possibly some of our enterprising weekly periodicals will be able to supplement their attractions in this way; or a new penny-in-the-slot policy will be obtainable in public places. It would be a good thing if, whenever the Government take in hand the rounding-off of their legislation affecting labour, they would instruct the official draftsman to put it all together in a single Act. It is shortcoming of the present Workmen's Compensation Act that it proceeds too much by reference. An illustration of this defect is the familiar fact that it required the collation of three Acts of Parliament of different dates to determine whether gas-works as such were touched by the latest Act. It is time, also, that the existing liberty of the workman who thinks that he has a claim against his employer to proceed either under the Workmen's Compensation Act or the Employers' Liability Act should cease, and the procedure be unified. It is to be expected that, whenever the new Bill appears, the labour interest will make a strong attack upon the "neutral zone." But it will never do for employers to be shorn of the protection they at present enjoy in this respect, without which there can be no doubt whatever that "footballites" would become an even more serious disease than it is now; for every pinched finger would develop into this troublesome malady, which is already one of the plagues of modern England. A single Act consolidating and summing up that part of the law of master and servant which deals with compensation for injuries received in the course, and by reason, of the employment, would be a worthy achievement of any Government. Nor, writing as a layman, would one suppose such a measure to be difficult either to draft or to carry through Parliament? The present Home Secretary is an eminent lawyer, with special knowledge of industrial matters. He should be just the man to put through a piece of constructive legislation affecting labour which would be fair to both employers and workpeople.

The Court of the Gaslight Company—Mr. Paddon and Mr. Field.

Recently many important changes in connection with the Gaslight and Coke Company's staff have been chronicled; and we have been awaiting with some amount of confidence the receipt of news of changes in the *personnel* of the Board. Last week announcement was made of the retirement of Mr. John Birch Paddon from active participation in the administration of the Brighton and Hove Gas Company, on account of the weight of advancing years; and it was only natural to suppose, in view of this, that it was merely a question of a brief space before intelligence would be received of the relinquishment of his seat at the Board of the Gaslight and Coke Company. Yesterday this expectation was fulfilled; official information coming to hand that the Directors had received with great regret, the intimation of Mr. Paddon's withdrawal from office, on the same ground as that which induced him to seek relief from the duties of Chairman of the Brighton Company. Mr. Paddon has been a Director of the Gaslight and Coke Company since 1891, and leaves his

colleagues with the knowledge of their full and sincere appreciation of the services he has rendered to the Company during the twelve years that he has joined in their deliberations. Before the advent of Mr. Corbet Woodall as a member of the Board, Mr. Paddon was the only existing Director who had had any practical training as a gas engineer and manager. It does not come as a surprise (though the policy of the Board may be questioned by some of the proprietors) to learn that Mr. John William Field, the late Secretary and General Manager, has been invited by the Directors to fill the vacant seat created by Mr. Paddon's retirement. Before the official announcement of these changes was received, the rumour had obtained circulation that another withdrawal from the Court and an elevation from the staff were pending; the names of Mr. Howard Charles Ward, the Deputy-Governor, and Mr. George Careless Trewby, the Chief Engineer, being mentioned. It may be remembered that the latter would long since have passed into retirement could the Board have placed hands on a suitable and willing successor. But at the time they could not; and, fortunately, Mr. Trewby's health has been so maintained—and, we believe, has improved in such measure—that he has been able to continue in his old position at the head of the engineering staff. However, we have authority for stating that there is no foundation for the rumour as to any contemplation of retirement on the part of Mr. Ward; he being in the best of health and spirits. Under the circumstances, it may be supposed there is no truth as to the prospective—or, rather, immediate—ascension to higher office of Mr. Trewby.

The Crystal Palace Gas Exhibition.

The applications for space in connection with the gas exhibition to be held at the Crystal Palace have, we learn from the Organizing Commissioner's office, been flowing in satisfactorily, since the identification with the project of the Institution of Gas Engineers and the issue of the prospectus. If this continues, the exhibition cannot fail to be a success. Meantime the Council of the Institution have nominated a small Exhibition Committee—chiefly composed of engineers in close touch with the Crystal Palace. Among their duties will be that of advising the Organizing Commissioner as to the classification of the exhibits, and to assist in any other way that may be considered desirable in furthering the preliminary work. It is, of course, necessary to have a small Committee of the kind, as the whole Council would be too unwieldy to be effectively useful. The advice of the Committee will ensure that the most advantageous display of the exhibits is made. The exhibition is now developing itself; the Institution are giving it their countenance and support; and the best thing in the interests of the industry is for all to do a part in making the display at the Crystal Palace during Christmas time of such a character that it will attract widespread attention. There is a proposal to hold in another part of the Palace at the same period a Printing, Stationery, and Allied Trades Exhibition. This may be regarded as a disadvantage by some people; but we are inclined to think that the greater the number of attractions in the Palace at the one time (so long as there is no real over-lapping), the greater the number of people, with their varied interests, who will avail themselves of the opportunity of visiting Sydenham. Printing and stationery will not put gas in the shade; it is more likely to be the other way about.

The Agricultural Value of Gas Lime.

From the time when, nearly forty years ago, the late Dr. Augustus Voelcker brought under the notice of owners and managers of gas undertakings, through the medium of the "JOURNAL," the value of gas-lime in agriculture, useful employment has been found for a residual which had previously been a source of much trouble. Widely as the efficaciousness of this material has been recognized, there is evidently room for its more extended use by farmers and others; and the efforts of gas managers to bring this about by the distribution of leaflets setting forth the late Professor's views are no doubt being attended with success. Leaflets, however, are liable to be laid upon tables with other papers and overlooked. What is most required is a little "straight talk" to men engaged in agricultural pursuits, at any of their gatherings. It was doubtless with the view of helping both farmers and gas managers in this matter that Mr. Charles D. Phillips, J.P., one of the Directors of the Newport (Mon.) Gas Company, decided to read a paper on the subject at the meeting of the Monmouthshire Chamber of Agriculture last Wednesday. The author has favoured us with a copy of the paper, and it will be found in another part of the "JOURNAL." It will be noticed that he brings into prominence a number of instances, taken from a leaflet issued by the Royal Agricultural Society, in which gas lime can be employed with great advantage; and as it can now be had practically for the asking, there is no reason why it should be allowed to encumber gas-works. Whether or not Mr. Phillips's paper will have the effect of stimulating the demand for gas lime, he certainly deserves the thanks of gas managers for his trouble in preparing it.

Bearing False Witness.

An instance of the danger of a little knowledge, when it is not sufficient to keep the possessor within the bounds of fact, is to be found in the "London Argus"—a paper devoted chiefly to municipal affairs. A writer of some notes on gas and electric lighting—remarking upon the recent statement of Mr. Hargreaves, the President of the Colliery Owners' Association, that gas coal prices were distinctly unremunerative to the colliery owner, and that the latter sighed for a return to the bigger prices of a few years ago—says that the average consumer of electric light and coal gas will hardly sympathize with this complaint, as in London at any rate, he has for a long time been "pretty severely fleeced" by gas companies and electric light undertakings alike. "The former particularly have been very slow to give the consumer the benefit arising from the cheaper production of gas due to the 'very extensive' use of water gas and other improvements in the process of manufacture." It would have been of some advantage to his readers if this writer, before putting his pen to paper, had, instead of proclaiming his ignorance, dipped a little into the real facts of the matter so far as the gas companies are concerned. He does not distinguish between the Companies in any way, but says that "in London" this fleecing has been going on. He therefore tars them roundly with the same brush. How he will succeed in justifying his statements when he is made acquainted with the facts remains to be seen.

Facts, not Supposition.

Here are a few facts that the "Argus" man could have found for himself if he had taken the trouble. They refer to last year, one year of high coal prices, and 1897—a year well in advance of the rise in the price of coal. Now last year the price charged for gas by the Gaslight and Coke Company varied between 3s. and 2s. 5d. per 1000 cubic feet (of course, the "Argus" will know all about the price in the southern district of the Gaslight and Coke Company being governed, under parliamentary enactment, by the price of the South Metropolitan Gas Company); by the Commercial Company, 2s. 8d.—this year 2s. 6d.; and by the South Metropolitan Company, 2s. 3d. The Companies paid last year for coal and oil 16·04d., 15·78d., 15·12d. respectively per 1000 cubic feet of gas; and the average return per 1000 cubic feet from residuals was 9·40d. Now when the price of coal in 1900 was up to 20·67d., 21·76d., and 22·54d. per 1000 cubic feet, the price charged by the Gaslight and Coke Company ran from 3s. 5d. down to 2s. 1d.—the last-named figure being for public lighting south of the Thames; by the Commercial Company, from 2s. 6d. to 3s.; and by the South Metropolitan Company, from 2s. 1d. to 2s. 8d. These prices must have been considerably more if it had not been for the average return of 13·07d. per 1000 cubic feet from residuals, and the reserves which the Companies largely used to prevent the full weight of the rise in coal falling upon the consumers. Adding to the price of coal last year the difference between the returns for residuals last year and in 1900, it will be seen that really, in respect of the net cost of material, there was very little difference. Yet all the Companies were and are supplying gas to the general consumers at reduced rates, as the foregoing figures show.

Before and After Top-Priced Coal.

To carry the comparison further, in 1897—well before the advance in coal prices set in—the prices charged for gas were: Gaslight and Coke Company, from 2s. 10d. to 2s. 3d.; Commercial Gas Company, 2s. 6d.; and South Metropolitan Company,

2s. 3d. But the price of coal in that year only equalled 13·64d., 14·87d., and 13d. per 1000 cubic feet. When he has compared these figures with those of last year, the "Argus" writer may wonder how the Companies could afford to supply gas last year at prices closely running on those of a period of such low-priced coal. One reason was that they were receiving for residuals an average of 9·40d. per 1000 cubic feet, as against 7·22d. in 1897. Yet, we learn, the consumers of London are being "pretty severely fleeced" by the Gas Companies! Then we cannot imagine what the writer means by the Companies having been slow to give the consumers the benefit arising from the cheaper production of gas due to the "very extensive use" of water gas, and other improvements in the process of manufacture. The South Metropolitan Gas Company do not make water gas at all; and the Gaslight and Coke and the Commercial Companies certainly not more than from 25 to about 30 per cent., at a cost approximating that of coal gas. We should like the "Argus" to explain what is really meant by the assertion, and to describe the "other improvements" that have been made and adopted in gas manufacture. It is only by hammering away at irresponsible and mischievous statements of this kind, that those who make them are enlightened and the truth ultimately gets abroad.

Voting Powers in Respect of Corporation Property.

In last week's issue, mention was made, on the authority of the "Pall Mall Gazette," of the fact that the Town Clerk of Wakefield had successfully claimed a vote, as the representative of his Corporation, in respect of the ownership of their water-mains which pass through Cleckheaton. The case has naturally aroused a good deal of interest; and as many other corporation officials will doubtless be desirous of enjoying, if possible, the same privilege as Mr. C. J. Hudson, the Town Clerk of Wakefield, has secured, it may be as well to notice a little more fully some of the arguments adduced when the matter was brought before the Revising Barrister's Court. As has been mentioned, the claim was based upon Vict. 30 and 31, cap. 106, section 10, which is to the effect that where a corporation is rated, any officer of such corporation whose name shall be sent in writing to the Overseers to be entered on the rate-book, shall be entitled to vote in respect of the property assessed, as if it were assessed in his own name. The Conservative agent admitted that the name had been on the list for a number of years; but he said he could find nothing in registration law to support it, for as no member of a corporation could vote, having no personal interest in corporate property, neither could any servant of the corporation vote. There was at the time of the hearing no copy in Court of the Act referred to; but while the question was being discussed, a messenger was despatched to see if he could borrow one. This he was successful in doing; and on the section quoted being turned up, it was found to clearly bear out the claim made. As, therefore, the Conservative agent was not at the time in a position to prove his contention that the section referred to had since been repealed, the Revising Barrister without further ado allowed the claim.

The Law on the Subject.

The matter was not, however, allowed to end here, for two days later, when the Court was being held at Heckmondwike, the Conservative agent endeavoured to re-open the whole question by asking the Revising Barrister to strike out the name of Mr. Hudson, without any notice of objection having been given, on the ground that he was on the list in respect of a qualification to which he was not by law entitled. He said the Act on which the claim was grounded could not by any stretch of imagination be made to apply to parliamentary or municipal law. It was known as the Poor Law Amendment Act, 1867; and that particular Act did enable any body corporate to place by resolution a representative of theirs on the rate-book, which was the list of electors for poor-law purposes. These particular clauses, however, had since been repealed by the second schedule of the Local Government Act of 1894. The Revising Barrister remarked that he had already decided the case when there was an objection raised; and, as the claim was quite good on the face of it, he utterly declined to open it again when there was no formal notice of objection before him. He refused to agree that "the matter was one which reflected considerably upon his reputation as a barrister," but said the agent could make a note of the point for another year. On referring to the second schedule of the Local Government Act of 1894, we find that it repeals section 10 of the Poor Law Amendment Act of 1867 "so far as it relates to the elections of Guardians." The question, therefore, turns upon whether this section ever had reference to any other elections than those of Guardians. If so, the powers it conferred are not repealed by the later Act. As, however, on the second occasion on which the matter was discussed before the Revising Barrister, the Liberal agent said he agreed with the contention of his Conservative colleague, and was prepared to have the claim struck off, it would almost seem that Mr. Hudson is in the enjoyment of his vote owing to a misapprehension of the state of the law on the subject. Whether this is so or not, it is pretty safe to assume that it will be definitely decided when the lists next year come up again for revision.

Purification Simplified.

A process of purification which is claimed to be a simplification of present methods, and to produce such a gain in the amount of tar and ammonia recovered that the expense of introduction or conversion is quickly overtaken by the increased profits, is something which must command the attention of gas engineers. The brilliant prospect thus held out, and an explanation of how it is brought about, is to be found in the abstract of a paper by Herr Burgemeister, of Celle, as published elsewhere. Shortly stated, the method is to saturate the gas as it leaves the retort or hydraulic main with aqueous vapour, the absorptive power of which admits of its taking up the tar, ammonia, and other compounds in the hot gas. The matters so picked up by the steam are thrown down when it is condensed. The tar is thus completely separated in the condensers, as well as some of the ammonia, carbonic acid, and sulphuretted hydrogen. The proof that Herr Burgemeister offers as to the efficiency of the system is that there is no tar left when the gas enters the tar-extractor; but, on the cessation of the application of the steam, tar reappears in the extractor. To remove the ammonia and other compounds from the gas, a washer has also been constructed to take the place of the ordinary scrubbers; and in it the purification of the gas is effected by special water-spraying apparatus. Or existing scrubbers can be converted to the system by removing the grids, and inserting the sprayer. These are the new methods which Herr Burgemeister has found such an improvement on former styles of working, and of which the details are described in the translation of his paper. It encourages confidence to learn that the results referred to are the fruit of practical working, and not merely of laboratory research.

Dr. Bunte on Purification.

The contribution which Dr. Bunte has made to the subject of purification, and which he modestly describes as "notes," is in several respects, particularly at the present time, of surpassing interest. It was published in three recent numbers of the last volume of the "JOURNAL," and some comments upon it, by German experts (made at the time of its original delivery in the form of a lecture) are given in this issue. The contribution is chiefly of value for the views it contains of such an eminent scientist as the Doctor upon matters lying between simple purification and ultra-purification as practised for the elimination of the sulphur compounds. This is sufficient to justify its publication to the extent that we have gone in the "JOURNAL;" otherwise, to the close student of the subject, it does not break fresh ground. Early in the opening passages, the Doctor strikes the note of his personal opinion, which harmonizes with that so largely prevalent in this country. It appears to him that there is no reason for departing from the extraordinarily simple and effective process of purification with ferric hydroxide, especially in view of the fact that it has been considerably improved by the addition of oxygen or air to the crude gas—effecting simultaneous revivification of the material in the vessels. It will not come as a surprise to those who followed the proceedings on the Crystal Palace District Gas Company's Bill last session to learn that purification by means of lime or material containing lime and ferric oxide, which was customary years ago, has been entirely superseded in Germany; and thus a cause of nuisance has been set aside. As to the admission of air to the gas for the purpose of revivification, it is Dr. Bunte's opinion that the supply need

not be varied according to the fluctuations in the proportion of sulphuretted hydrogen in the gas—it really being better to add rather less air to the gas than corresponds with the average proportion of sulphuretted hydrogen present, because, even with the theoretical air supply, some sulphide of iron persists in the material, and escapes revivification. Theory indicates that the volume of sulphuretted hydrogen requires half a volume of oxygen, or about two-and-a-half volumes of air.

Carbonic Acid and Sulphur Compounds.

Dipping further into Dr. Bunte's conclusions, it is seen that he regards the question of carbonic acid in the gas as being of little importance, especially in view of the large and growing use of the incandescent burner—indeed, the proportion of carbonic acid, he finds from experiments, may in an incandescent burner fluctuate within tolerably wide limits without appreciably affecting the use of gas for incandescent lighting. The same thing is true with regard to the employment of gas for heating purposes, as the carbonic acid acts partly as a diluent, and presents no further disadvantage. It is also of interest to observe, in view of recent controversy, that the Doctor holds that the elimination of sulphur compounds other than sulphuretted hydrogen in the gas is of no importance hygienically. Still he considers that experiments at lowering the amount of sulphur by appropriate absorbents have some object; and he would rather instigate trials in this direction, and on a practical scale, than otherwise. He is also in favour of making experiments to see if the customary box purification cannot be improved upon in a simple manner, and the difficulties attendant upon it avoided. From all of which, it will be seen that Dr. Bunte, with his great perceptive power, is at one with some of the best scientific and engineering authorities in this country in believing that simple purification amply suffices for the needs of the day.

Output of a Gas-Works Having Ten-Inch Connections.—With reference to "Manager's" question in the last number of the "JOURNAL," "S. B. C." writes to say that with 10-inch connections they are making 90 million cubic feet of gas per annum; and he does not anticipate any difficulty in producing 100 millions. He is quite aware this does not in any way coincide with Mr. O'Connor's "Pocket Book."

Bournemouth Gas and Water Company.—We are asked to state that the article which appeared in the "JOURNAL" for the 29th ult. (p. 819) was in places inaccurate. At the present time the Company have no Consulting Engineer, other than their Resident Engineer and General Manager, Mr. Harold W. Woodall, who is now engaged in preparing plans for new and extensive gas-works, with all modern appliances. These works will be erected in the course of the next few months on the quay at Poole Harbour, whence not only the town of Poole, with Parkstone, will be supplied with gas, but a large supplementary supply will be sent into Bournemouth, and thus avoid for some years to come the necessity of materially enlarging the existing gas-works in the Bourne Valley. Mr. Cripps points to two mistakes in the article, which he wishes corrected. The date on which he was first engaged to carry out engineering extensions for the Company was stated to be 1900; whereas it should have been 1890—that is, ten years earlier. Further on, the article read: "With the exception of gas-mains for coupling up the recently acquired district of Poole, very little has been spent on extensions in the gas department during the past few years." This, Mr. Cripps says, is misleading, as the last words should be "year or so," not "few years."

Midland Association of Gas Managers.—For their autumn meeting on the 22nd inst., the members of the Association are having a change from what is customary. They are not meeting in Birmingham, nor have they any technical matter down for discussion; and they will not want it. Accompanied by their President (Mr. Charles Meiklejohn, of Rugby), they are visiting Walsall, where there will be plenty that is of interest to engage their attention. An hour is set apart for a business meeting, at which general matters will occupy but a brief space; the election of officers being the principal item. Following this will come a description of the Corporation gas undertaking by the Engineer (Mr. B. W. Smith), and immediately afterwards a visit will be paid to the works, where the visitors will be received by the Mayor, the Town Clerk, and the members of the Gas Committee. It will be remembered that a series of illustrated articles explaining the extensive scheme of improvement which Mr. Smith had been carrying out at the works appeared in the first volume of the "JOURNAL" for 1902; but since then there have been additions—among other new features being a De Brouwer coal projector (electrically driven) and an installation of the cyanide extraction process of the British Cyanide Company, Limited. The time which has been allotted to the inspection will be none too much, in view of all there is to be seen. Later in the afternoon, the members will be entertained at dinner at the Dragon Hotel.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 111.)

THE Stock Exchange has had a better and less agitated week than the last one chronicled; but even this has not been free from some dark lines of shade. It opened with the brightness that marked the close of its predecessor, and Consols made a promising commencement; but this was soon checked by weakness in South Africans and Americans. The Duke of Devonshire's resignation was next seized as a depressing lever. In its turn a brighter view of things succeeded, only to be displaced by nervousness, especially as the eve of the settlement loomed in view. The result of all this at the finish was that prices all round showed for the most part a shrinkage. In the Money Market, pronounced weakness ruled almost up to the close, when the tendency became firmer. Business in the Gas Market showed a considerable increase in volume, though it was principally restricted to dealings in the biggest issues. The general tendency was favourable, and changes in quotation, with one exception, were in the upward direction. In Gaslight and Coke issues, there was an unusual degree of activity in the ordinary, which was sluggish at first, and was marked on Tuesday as low as 84. But the next day it began to advance; and it steadily rose until on Saturday it changed hands once at 88—the quotation being two points up. The secured issues were too quiet to make much show; but the later prices were better than the earlier. South Metropolitan was in moderate demand; and, after marking one special bargain on Monday at 115, it stiffened up and commanded 118 several times. The debenture, too, was half-a-point higher. Commercial was only marked once, but at a steady price. Business was quiet and changes were few in the Suburban and Provincial group. A parcel of Brentford was thrown away "specially" at the low figure of 230, and the quotation was dropped five points. In the local Exchange, Liverpool "B" was fractionally better. Extreme quietude characterized the Continental Companies. Imperial jumped off with two points advance, but the subsequent figures were not particularly good. None of the remoter undertakings offered anything calling for remark. Business in the Water Companies was very dead—in fact, business continues in a state of suspended animation, while their fate hangs in the balance without a clue which way the beam will go. Prices were generally poor, though Southwark was quoted a shade better.

The daily operations were: Very quiet business in gas on Monday, and movements were irregular. Imperial rose 2, and South Metropolitan debenture ½; but Brentford old fell 5. Business became more active on Tuesday and Wednesday, but without any changes. Thursday was the most active day of the week. Gaslight ordinary rose 2, and Southwark Water 2½. Friday was fairly busy, and South Metropolitan advanced 1. Saturday was quiet, with good prices. Gaslight ordinary improved 1.

ELECTRIC LIGHTING MEMORANDA.

Municipal Electric Lighting Finance—Two Examples—The Ratepayers' Responsibility—The Dublin Rule.

Two municipal views of electric light finance are on exhibition at the present time, and both are painted in very dark colours. One concerns the Metropolitan Borough of Marylebone, and the other affects Dublin. The London case is better than that of the unfortunate sister capital, inasmuch as the burden is only impending, and has not actually come upon the ratepayers; whereas Dublin is hopelessly involved. The Local Government Board have now pronounced their judgment on the application of the Marylebone Borough Council for the loan they require in order to carry out the electric light purchase, and it is to the effect that they support the London County Council in refusing the proposal. The Borough Council, anticipating this decision, have done the only thing possible in the circumstances, by taking the initiative to promote a Bill in the ensuing session of Parliament for obtaining the statutory permission to constitute themselves the electric lighting authority under the Acts of 1882 and 1888. The remarkable feature of the present deadlock is that because the Borough Council are not the undertakers, they cannot borrow the money necessary to become so. Very naturally, the question is asked why those who were responsible for the Act of 1901, under which the Council proceeded to arbitration, did not make sure of the ground in all respects. According to a paragraph which has been supplied to the press, and is reproduced elsewhere, this appears to be impossible. It is a remarkable state of affairs, from whatsoever point of view regarded.

The merits of the Marylebone project, apart from the statutory muddle, are seriously exercising the minds of the ratepayers and their representatives. While the Borough Council have no option but to arrange for taking further parliamentary action, this is where the Borough Funds Act comes into play; and the ratepayers are being adjured to withhold their sanction to the Bill.

It is strongly felt that the folly of the old Vestry and the majority of the Council which succeeded it, has brought discredit upon the whole order of Metropolitan local government. At a public meeting of ratepayers of the borough held last week to discuss the situation, Mr. Edward White, of the London County Council, said that the Progressive members of that body were wroth because they considered that the muddle into which Marylebone had got had inflicted a greater blow upon municipal trading than all the newspaper criticism of the matter. There can be no doubt of this. The scheme is such a mad one, that the "principle" of municipal trading collapses under it. If the principle were trustworthy, and any local authority could be depended upon to do electric lighting better than any company, this Marylebone deal would not be a bad bargain for the ratepayers. The price is a long one, it is true; but nobody has pretended that it is not fair value for the property. The real consideration that weighs with the public in this regard is that the Borough Council cannot be trusted with such a big business, and ought never to have meddled in it.

A member of the Lighting Committee of the Marylebone Council—Dr. Walter Leaf—argued at the recent meeting that "for the present situation the ratepayers were primarily responsible, as they had not objected to the steps hitherto taken." This observation applies equally well to the ratepayers of Dublin, who are paying through the nose for the apathy with which they permitted the nonentities whom political considerations have placed in municipal power, to commit them to the superfluous undertaking which was the subject of a further Local Government Board inquiry last week. It is, of course, perfectly just, and as true as a copy-book heading. It is also about as operative, in real life. Although the theory of local government is as Dr. Leaf has diagnozed it, everybody knows that in practice the ratepayers are as helpless in the hands of their elective representatives as are the shareholders of a company in those of the directors. It is for this reason that it is incumbent upon the members of local authorities to act with a proper sense of personal responsibility to the public for all they advise and do. It is not a sufficient check upon them that they can be turned out for mischief done. This punishment will not mend bad matters. Everybody knows what power the Imperial Government wields, and what sad trouble unwise counsels can bring upon the country; yet an Administration can be dismissed in a moment, at any time, by a breath of public opinion. The power of committing a district to a mistaken course which reposes in the local authority, is far less amenable to popular correction. Men who take part in the onerous and thankless duties of local government ought to possess enough of the quality of statesmanship to divine how far they can go with propriety along paths which, from the nature of things, cannot be retraced; and it smacks of the doctrinaire, or a still more objectionable character, to plead that the governed are party to every proceeding which they do not prevent. The veto of the ratepayer is really comparable to the "sacred right of insurrection" which rests in the citizen and subject as a last resource against tyranny. It is a poor government, however, which reminds the people of these truths.

Incidentally, the experience of Dublin throws some light upon the vexed question of the expediency of providing for the depreciation of municipal electric lighting plant. Some may remember that when this question was first raised, which we believe was in connection with the undertaking of the St. Pancras Vestry, it was pleaded that the "Dublin rule" was that the sinking fund is adequate for all purposes of the kind. Now it has been shown what this really means. The original Dublin undertaking stood the Corporation in £90,000, and dates from 1892. Not much, therefore, of the loan has been repaid. Now the works are demolished, and the whole thing swallowed up in the big new scheme of the Corporation, of which the capital account appears to have a considerable degree of elasticity. The "Dublin rule," in the event, has failed to provide for liquidating the financial responsibility of the ratepayers of the city under the old obligation; and the same observation applies to all perishable property of the kind, whatever the ownership.

THE ELECTRICAL FIRE HAZARD.

THERE is an article on the above subject in the current number of "Cassier's Magazine" some points of which the gas engineer should have in his possession, and to which the electrical engineer would do well to devote more than cursory attention, because it is not good for one's industry or profession to have, for example, such an indictment as this levelled at it: "It is true that standards are constantly being raised, and that electrical equipments are being installed in compliance with those higher standards; but the hazard from electrical sources is increasing even more rapidly, and there is a continual overflow (so to speak) which has not been provided against, and which marks the line between perfect safety and danger." The author of this statement and of much more that precedes and succeeds it, is Mr. J. C. Forsyth, who is apparently more interested in the question of the fire risk and the payment of the loss than in the growth of the electrical industry during the past two decades. From the point of view of the individual or corporation who has to carry the fire risk, the "roseate tints" (as Mr. Forsyth picturesquely puts it) of that growth have, it appears, lost their entrancing power, and, in a correspondingly increasing ratio, have assumed a "fiery red," which it is difficult to contemplate without "varied emotions of dread and apprehension." When a man writes in this gloomy style, it seems to indicate that he himself has been, and is being, rather hardly hit.

It is admitted by Mr. Forsyth as undoubtedly true that electricity is the safest form of artificial illumination; but the admission is coupled up with two important reservations—(1) *If* the prescribed standards are followed; and (2) *if* proper maintenance and supervision are given. "How these 'ifs' do loom up to the electrical insurance man who is in a position to know and to appreciate the great chasm between what is and what should be, and which these 'if's' are supposed to bridge." Then follows the assertion already quoted that, the higher standard for electrical equipment notwithstanding, the hazard from electrical sources is increasing. Underlying this statement is something more than assumption. It is instanced how, in a certain district, in 1902, a total of forty fires was investigated; and every one of these was "unquestionably due to electric wires or apparatus." Thirty of the fires were directly attributable to the breaking down of the insulation on the conductors; six were due to over-heating of various devices; one resulted from sparks thrown from a commutator of an electric motor; one from the ignition of inflammable material by melted fuse metal from a cut-out; and two were due to crosses on outside wires which came in contact with miscellaneous conductors entering buildings for different purposes. This writer, who is undeniably well informed on his subject, has little doubt that other fires in the same district originated from the same source; but all the evidence as to their origin was destroyed.

It will be observed from the list of causes that no less than thirty out of the forty fires were attributable to the failure of the insulation on the conductors; and, if this is true, then the protection that the "rubber compound" insulation affords can be of only short duration. Its deterioration appears to commence early. It becomes dry, hard, and brittle, and does not any longer resist abrasion, nor prevent moisture from getting to the conductors. A flow of electricity, even if slight, over any such material as rubber, wood, and like substance during the presence of moisture, carbonizes the fibre, which, it is pointed out by Mr. Forsyth, thereby becomes a conductor, and, if the electricity continues to flow, the material will sooner or later burst into flame. It is not a pleasant thing for electricity consumers to contemplate that the increasing age of their electric wiring means increasing danger. One of the most difficult things, however, an insurance department has to do, it seems, is to prove to the lay mind that an installation which has been in use for several years is in an unsafe condition, owing to the poor state of the insulation; and, we suppose from this, the only remedy is for the consumer to suffer the expense and inconvenience of having all his wiring renewed. By instances, too, of the violation of prescribed rules, the author of the article proves once more the truth of the hoary saying that "familiarity breeds contempt."

Mr. Forsyth, it is evident, understands fully what he is writing about; and therefore, without any intention of being unkind, we may repeat a few of the closing words of his article: "A little knowledge of electricity and the laws which govern it in its application to power and lighting systems, well seasoned with ordinary common sense, would enable almost anyone to understand the average precautions necessary in the safeguarding of electrical wiring and apparatus; and if this knowledge, so seasoned, were occasionally applied, the fire losses from electrical causes would be largely diminished." There is something sarcastically funny about this quotation. Apparently, if knowledge and common sense were only *occasionally* applied in electrical fitting work, Mr. Forsyth would find in the change a cause for thankfulness. Truly his experience of such work in the past must have been terribly bad.

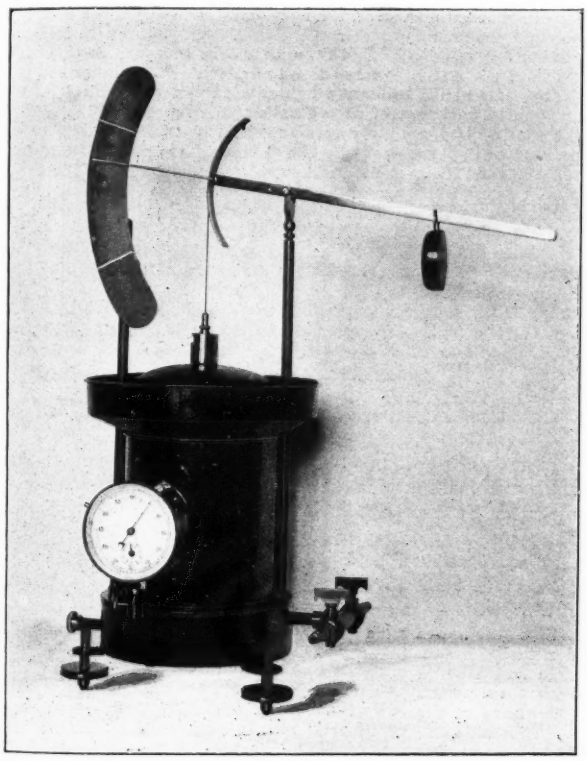
Institution of Civil Engineers.—The opening meeting of the ensuing session will be held on the 3rd prox., when the President (Sir William H. White, K.C.B.) will deliver his Inaugural Address, which will be followed by the presentation of the Council's awards for communications discussed at the meetings of the Institution in 1902-3. At the close of the business, there will, as usual, be a reception in the library.

Subways for Gas and Water Pipes, &c.—Under the auspices of the Paviors Company, a competition was instituted some time ago on the subject of "Subways or other Means of Placing and Maintaining, without Interference with the Surface, the Main Pipes and Services of Gas, Water, and other Undertakings below the Carriage Ways or Footways of Cities, Boroughs, and Towns." Essays, drawings, and models were submitted by 26 competitors, and were considered by the Judges—viz., the Master of the Company (Major L. H. Isaacs, the Mayor of Kensington), Mr. D. J. Ross, M.Inst.C.E., the Engineer of the City of London; Mr. J. W. Bradley, Assoc.M.Inst.C.E., Engineer of the City of Westminster; and Mr. W. Weaver, M.Inst.C.E., Engineer of the Borough of Kensington. The following awards were made: First premium (£105) to Mr. R. M. Parkinson, Peterborough; second premium (£31 10s.) to a competitor whose name had not been ascertained; third premium (£21) to Mr. F. M. Royle, Assoc.M.Inst.C.E., Nottingham.

A HANDY TEST FOR PERMANENCE OF GAS ENRICHMENT.

In dealing last week with the development of the Simmance-Abady "Flicker" photometer, we were restrained, by the numerous claims on our columns, from noticing a second recent production, designed by the same prolific inventors, for the useful purpose of testing the permanence of enrichment. The evidence on this point is contradictory. Some engineers assert that the addition to gas of certain enrichment agents is only valuable within a limited area—that all effects from the enrichment are lost long before the gas arrives at the extremities of the district of supply. Other engineers are of the contrary opinion; and there are few districts in which this inconsistency of view and belief can be satisfactorily determined by the existence of testing-stations in parts remote from the gas-works. This doubt, it seems, need not continue. The apparatus that Messrs. Simmance and Abady have produced is offered as, and appears to afford, a ready and reliable means of testing, in any locality or situation, gas enriched by various methods; all that is required being the connection of the apparatus to the gas supply by means of a simple rubber-tube.

The inventors, in some notes which they have prepared on the subject, propound three questions: (1) Does gas lose its lighting and heating power in travelling through the mains? (2) Why does a test of lighting and heating power made in a district of supply frequently differ from the results obtained on the works? (3) Are abnormal results in testing to be put down to inaccuracies in experiments (ventilation, candles, &c.), or has the gas altered in composition? These questions they do not answer; but they submit that there are two means of solving them. The first is to ascertain, by careful analysis, if a change in the composition of the gas has taken place; and the second is to find if the specific gravity has altered. Of course, the former is a lengthy and troublesome operation; and for the latter—for experiment anywhere outside the laboratory—a simple and portable specific gravity apparatus is required. It is a portable specific gravity bell which Messrs. Simmance and Abady have designed for this special purpose. It is not suggested that specific gravity has any definite ratio to lighting or heating power; but, if the specific gravity of a gas is the same (say) at the town testing-station as at the works, then the photometrical and calorific tests should be identical at both places. Therefore, the specific gravity of the gas may be taken as a fairly reliable indicator of permanence or the reverse; and if a gas has lost any of its constituents in travelling from the works to any point in a district, the new specific gravity bell cannot, it is claimed, fail to show the difference.



The Simmance-Abady Specific Gravity Bell.

The apparatus (as illustrated) consists of a small water-tank, in which a bell is suspended from a balance-beam. The crown of the bell is drawn out so that a stand-pipe may be brought well above the water-line, although the bell itself is submerged up to the crown. The apex of the upper crown is formed of a small silver plate, in which a very fine effusion-hole is drilled; and this is covered by a protecting cap. As seen, there extends from the beam a fine pointer, indicating upon a plate marked with two divisions. At the inlet to the stand-pipe is a two-way cock for gas and air, or blow-off; the gas-way, in making a test, having to be connected by flexible or other tubing to the gas-service, while the air-way is free. [It is pointed out that an extra degree of exactitude is proved if the air is passed through caustic potash, so as to absorb its carbonic acid.] Fixed to the tank is a minute clock, showing half seconds, with start, stop, and set-to-zero.

In making a test, the apparatus must be levelled by the screws, to ensure that the bell hangs level in the tank. The bell, by its own weight, is normally submerged; the tank being filled with water just to cover the dome, and only the small effusion chamber filled with air. The clock-hand is set to zero; and the weight has to be moved to the notch at the outer end of the beam. The air-cock is next slowly opened—filling the bell with air, and taking the pointer up beyond the highest mark on the quadrant. The air-cock must now be closed, and the beam held with one hand, and with the other the weight moved to the next notch—thus permitting the air to escape through the effusion-hole and the bell to fall slowly. As the pointer passes the highest mark on the quadrant, the minute clock has to be started, and stopped as the pointer passes the lowest mark—the time in seconds being noted. The next operation is to reset the clock-hand at zero; and, without moving the weight, to slightly open the gas-cock—holding down the bell for a second or two (to expel the last traces of air through the effusion-hole), and then releasing it to allow of it rising as before. When the pointer is well above the highest mark on the quadrant, the gas-cock must be turned off. After a second or two, the confined gas will have attained atmospheric pressure, when the bell will fall slowly. As the pointer moves beyond the highest mark on the quadrant, the minute clock must be started, and stopped as the pointer passes the lowest mark; the time in seconds being noted. The gas-time squared divided by the air-time squared is the specific gravity of the gas (air = 1)—*e.g.*, air-time, 59 sec. ($59^2 = 3481$); gas-time, 41 sec. ($41^2 = 1681$). $1681 \div 3481 = 0{\cdot}482$ sp. gr. of the gas. This is all that has to be done; and a short acquaintance with the apparatus will remove any question of complication which this detailed description of the operation may suggest. The inventors point out that no corrections are needed, unless the readings of the barometer and thermometer alter during the test, which is improbable.

In the use of the apparatus, three chances of error are suggested: (1) The personal; (2) the imperfect blowing off of the air or gas; and (3) one other, which needs explanation. As to the first, it is asserted that the personal error is no greater than with more elaborate specific gravity tests; and regarding the second, imperfect blowing off of the air or gas can be obviated by a little care. The third is the fact that, as the holder is longer out of the water with one gas than the other, a great difference of temperatures between the air of the room and the water may affect the readings—to varying extent according to the specific heat and conductivity of the gas—as may also the fact that the heavier gas will give the wet holder more time to dry; and thus slightly lessen its weight (and resultant pressure) during the last part of the descent. These chances of error are, however, more than counterbalanced by the ease and rapidity with which the test can be made, and repeated if required. Indeed, according to Messrs. Simmance and Abady, they are purely theoretical, and do not appear in practice. However, the description shows the apparatus offers a means of making anywhere comparable tests for specific gravity; and, though perhaps not so exact as refined laboratory methods, it is sufficiently so for the purpose it has been specially designed to serve—that is, the ascertaining, by a specific gravity test, of the travelling power and permanence or otherwise of gas-enriching agents.

AN AMERICAN TREATISE ON ARTIFICIAL LIGHT.

It is hardly necessary to repeat the observation, which we have often had occasion to make, that the American language differs considerably from English. Yet the reflection recurs to the mind irresistibly upon taking in hand the book which the author, Dr. Bell, of New York, entitles the "Art of Illumination"*—meaning in English the science of lighting. No Englishman could have hit upon such a title for such a work, because in English the art of illumination means something very different from lighting. It signifies, as Dr. Bell may or may not know, the art of the illuminator of books and "addresses" in manuscript. Perhaps this is never done in the United States; or if it is, it is called by some other name. At any rate, this confusing trick of some American writers, of using common English words in senses of their own choosing, is both an irritating and a mischievous failing of theirs. It is annoying, because the reader is continually being brought up all standing with a dislocation of ideas, when he has to painfully adjust his perceptive faculty to the distortion of the language in order to understand what is the meaning sought to be conveyed;

* "The Art of Illumination." By Louis Bell, Ph.D. Fully Illustrated Westminster: Archibald Constable and Co Limited; 1903.

and it is objectionable, because such bad writing ought never to be put in the way of young people with their own style of expression to form. Let it be understood, therefore, that this book of Dr. Bell's is very American, and that it is not at all easy everywhere for an English reader to follow. It is now our duty to discuss the author's matter. He calls his work "A Study of the Utilization of Artificial Light;" and he states its intention as being "to deal not with the problem of distributing illuminants, but with their application." This he calls an "art." It is further described as the employment of the materials at hand to produce the required results, which must be done, as he says, by following lines which are to a very considerable extent subject to fairly well-defined laws. "Sins against these laws are all too common, the more so since artificial light has become relatively cheap and easy of application." So now we know what to look for.

It is clearly quite possible to allow Dr. Bell the use of the term "Art" for his way of dealing with artificial lighting. For, as he says, there are two kinds of lighting—the useful and the scenic. The former is a service, the latter a display. Sometimes the two are blended in one arrangement; but even so it is necessary to observe the distinctive purposes. Dr. Bell is no dry pedant, but takes his reader along very pleasantly as well as helpfully. His scheme involves beginning with the eye; and he treats of the sense of sight in a way which does not lose in mastery of the subject for all its popular form of description. The first bit of science we meet with is the statement of Fechner's law of visual sensation by Helmholtz. Substantially the law so called is that, within very wide limits of brightness, the amount of light in which objects are seen does not matter to our power of vision. With great variation of the intensity of lighting, its effectiveness for practical purposes remains about the same. The range of intensity of daylight from sunrise to sunset is as much as one hundredfold the minimum necessary for vision; yet we can see about equally well through it all.

Proceeding to discuss the actual amount of lighting necessary and desirable for human uses, Dr. Bell proposes to take for his standard of quantity the candle-foot—being the degree of direct illumination of a surface by a standard English candle at a distance of one foot. Coming to the inevitable law of inverse squares, Dr. Bell shows that while it is a true and useful rule to know, it does not convey the whole truth about the flow of light from any source. An electric arc search-light is an example of the exceptions which occur in practice to the law of inverse squares, because it has a very large proportion of the total luminous energy concentrated by reflectors and lenses into a nearly parallel beam which maintains an extremely high luminous intensity to great distances from the source. If the search-light beam were really parallel, it would be equally bright at all distances, except for the diminution by atmospheric absorption, which is small in clear weather. Dr. Bell next discusses the unit brightness of the luminous source—a matter which, as he remarks, though of most serious physiological significance, is not often regarded as of importance in schemes of lighting. He takes the standard candle again as the datum, and rates its intrinsic brightness logically at one-candle power per square inch. Is the standard candle flame, we ask, exactly one square inch in area? Dr. Bell gives a table of average values of intrinsic brightness for several illuminants in common use; and this brings out the striking fact that whereas the ordinary lights of combustion—candle, oil, or gas flame—are of about the same unit intensity, the lights of incandescence are vastly brighter. This, from the oculist's point of view, is dangerous. The intrinsic brilliancy of the filament of an incandescent electric lamp is known to have caused blindness in a few weeks—the light falling steadily on the same point of the retina at about 2 or 3 feet distance. Dr. Bell discourses very instructively concerning the effect on the human vision of too bright lights; explaining how putting an opal shade upon a brilliant light considerably improves the general lighting, by reason of the retina having a much better working aperture.

It is well laid down that, for satisfactory artificial lighting, the proper thing is to start with a fairly good general light, strengthened locally where required for any special purpose. This is far preferable to a spotting of strong light in a generally darkened interior. The amount of lighting is of the first importance; and Dr. Bell considers that about one candle-foot is the minimum for comfortable reading, with such type as is here used, for example. Comparing this with diffused daylight, it will be found that on a clear day the light in a room near a window, while the sun is still high, will be from 5 to 10 candle-feet. Dr. Bell acutely observes that reading and writing require less light than almost any other "processes" which demand close ocular attention. Any fine mechanical work calls for more light, especially if the objects are coloured. The author discusses, with particular cleverness, colour in relation to lighting; and we do not recall any equally good work in this field. He insists upon the greenish tinge of the Welsbach light, while crediting Siemens burners with a nearly white light, faintly tinged with yellow. His treatment of the subject of reflection and diffusion is very full.

It will be apparent, from what has already been said, that this book is quite an original study of the subject-matter, from a point of view which is not that of any other book about lights or lighting. Perhaps it would be the fairest description of the author's work to say that he makes far more of the physiological aspect of his subject than any other writer has ever done. His style throughout is chatty to the verge of verbosity; but his evident knowledge of his matter saves him from becoming tiresome. He is also very fair to the different kinds of lights he describes, except that he only allows the Welsbach light an efficiency of from 12 to 15 candles per cubic foot. Still he remarks that this "is by far the cheapest known illuminant except the electric arc at a rather low rate for electrical energy." He does not believe in the lamps generating their own petroleum gas locally, and using it with a mantle; but he speaks well of the cheapness, at American prices, of air-gas incandescent lighting where a gas supply is not obtainable. Dr. Bell's taste in fittings is distinctly French. His mathematics are sound, and kept as simple as possible. He is a thoroughly trustworthy guide; laying proper stress upon the necessity for shading all interior lights, and understanding the use of reflectors. In treating of church lighting, he advises his reader to "avoid chandeliers as you would shun poison." He suggests the use of clusters of six or eight Welsbachs carried by brackets between the windows, at from half to two-thirds the height of the wall, with possibly larger groups massed at the four corners of the transept crossing, if there is one. He has not thought of floor standards, which are preferred by some. He admits the difficulty of making incandescent gas-lights decorative in a large interior, and therefore suggests that they should always be kept as unobtrusive as possible. Referring to the customary description of electric arc lamps as of "2000-candle power" for a "full arc," or 1200-candle power for a "half-arc," Dr. Bell points out that "these alleged candle powers are never obtained, even in the direction of maximum illumination." Reduced to mean spherical measures, the lighting intensity of these lamps is 600 and 300 candle power respectively. He gives an instructive photograph of a light effect from an arc in a rather dirty globe, showing the darkness immediately underneath the lamp and the narrowness of the brilliantly lighted area, with the rapid fading away into darkness of such details as the fencing by the side of the road. The author waxes sarcastic over the economics of public lighting systems as he knows them. He declares that the relations of municipalities and supply companies are "mutually predatory;" while where the municipality does its own lighting, the accounts of the cost are never to be relied upon. He very truly observes that the particulars of public lighting ought to be laid down in every case by someone practically familiar with the data given in this book. We are pleased to be able to add to this good advice the assurance that those who follow Dr. Bell's counsels will not go astray. The book is well printed in good, legible type, and adequately illustrated with new blocks. The worst thing about it is the title.

A MERITORIOUS GERMAN GAS MANUAL.*

THE work, of which an advance proof is now before us, reflects much credit on the author, for it is both well conceived and well executed. It aims at giving briefly an account of the equipment of a gas-works, the modes of operating, and the manner in which they are controlled by the competent gas manager. Herr A. Schäfer, the author, is Manager of the Gas-Works at Ingolstadt, in Bavaria.

Since the appearance of the well-known Schilling's "Handbuch der Gasbeleuchtung"—the "King's Treatise" of Germany—more than half a century ago, there have been many works dealing with gas manufacture published in the German language; but they have dealt with it either purely from the constructing engineer's standpoint, or have been merely chemical treatises, or have been limited to a particular branch or aspect of the subject. Other perhaps more comprehensive treatises have become more or less obsolete. Herr Schäfer's work, therefore, will be welcomed by managers, superintendents, and foremen of gas-works wherever the German language prevails; and those readers of the "JOURNAL" in this country who are German scholars will also find the book will well repay perusal. Of course, in their case, there are also the difficulties presented by the statement of quantities in the metric system of weights and measures to be surmounted; but these will not greatly trouble habitual students of French and German technical literature.

With regard to the equipment of gas-works, Herr Schäfer has been content, for the sake of conciseness, to describe only one typical form of each piece of plant. This suffices, as a rule, to enable him to indicate the principles governing the operation of such apparatus in general; so that the reader who is more familiar with other forms of plant will not find the author's remarks uninstructive. The apparatus selected for description appears to be fairly typical of the best German practice, which of course is not throughout identical with English procedure, so far as the form and disposition of plant is concerned.

The first chapter (occupying 60 pages) deals with coal, and is on the whole eminently practical. The very necessary, but rarely given, instructions for the proper sampling of coal in bulk, appear early in the chapter, and are followed by concise directions for

* "Einrichtung und Betrieb eines Gaswerkes." "Ein Leitfaden für Betriebsleiter und Konstrukteure, bearbeitet von A. Schäfer, Ingenieur." "Mit 185 Abbildungen und 6 Tafeln." Munich and Berlin: R. Oldenbourg; 1903.

the estimation of the more important constituents of coal, and for the determination of its calorific power. Then comes an account of a miniature gas-works plant for testing by the carbonization of small samples the comparative gas-making values of different coals. It is on a smaller scale than the corresponding plant commonly used in this country, which takes charges of $1\frac{1}{6\,0\,0}$ ton or (say) $2\frac{1}{4}$ lbs.; whereas the apparatus described by Herr Schäfer deals with charges of only $\frac{1}{2}$ kilogramme or (say) $1\frac{1}{10}$ lbs. The working of this small plant, as well as of a full-sized experimental gas-works, is described; and then the author gives a very good summary of the phenomena of the process of carbonization. The storage and the spontaneous ignition of coal are treated very thoroughly; and the first chapter concludes with a recapitulation of Mahler's data on the calorific balance of the carbonization of coal. Strangely enough the author, who is generally quite up to date in his references, appears to have omitted to notice the even more complete data subsequently obtained by Euchêne, as fully reported in the "JOURNAL" a few years ago.

The second chapter is on retort-settings. It contains a good account of the theory and practice of gaseous firing as applied to the heating of both horizontal and inclined retorts. Direct-fired settings are quickly dismissed. The construction of the benches and the general arrangement of flues are handled fairly fully; while the author has not omitted to devote a special section to the repair of settings. On the putting in action and control of the working of the furnaces, he is particularly informative. The analysis of furnace gases is concisely, but we think adequately, handled. Charging machinery is represented by Eitle's scoop machine, which was described in our pages last week.

The third chapter is a short one on condensation, and the fourth is on tar-extractors, of which the Pelouze type of apparatus is favoured. The fifth chapter is highly novel, being devoted solely to the abstraction of naphthalene from gas. Two practical processes are described—viz., washing the gas with tar-oil, and the method of vaporizing xylol into the gas as it is about to leave the works. The latter method is, as readers of the "JOURNAL" will remember, the outcome of experiments made some few years ago by Dr. Bunte and Dr. Eitner. Both processes are in regular use in Germany; and Herr Schäfer gives diagrams of the apparatus employed, as well as the results of practical experience. The sixth chapter deals with exhausters and governors.

The seventh chapter describes washers and the methods of controlling their working, and, like the following chapter on the working up of gas liquor, is to a considerable extent taken up with analytical data. The same remark applies to the ninth chapter on purification. The only impurities considered are sulphuretted hydrogen and cyanogen, as purification from carbonic acid and carbon bisulphide is practically unknown in Germany. The tenth to twelfth chapters are devoted to station meters, gasholders, and governors, and are concise and good. The thirteenth, and final, chapter covers a multitude of small important physical and analytical details essential for the proper control of the manufacture and distribution of gas.

THE MECHANICAL HANDLING OF MATERIAL.

THE extensive adoption of mechanical means of carrying gas-works materials, and the consequent increased interest in the subject, have often been commented upon and illustrated in the pages of the "JOURNAL." In our issue of March 3 last, we gave a summary of a paper, under the above title, which Mr. G. F. Zimmer had read before the Institution of Civil Engineers. A volume, recently issued, of the "Minutes of Proceedings" of the Institution contains the paper in full; and there are one or two points in the subsequent discussion upon it that may prove of interest. A large proportion of the observations made refer to matters outside the immediate purview of gas engineers—such as the conveying appliances used for timber transport, dredging purposes, blast-furnaces, coal-ship loading, and grain carrying; one speaker, in reference to the last item, saying that, "from an engineer's point of view, wheat seemed to have been specially created in order to be raised!" The detail under consideration was the tightening-gear of an elevator chain, which gear is usually arranged in the boot at the bottom. It was suggested, however, that, where it was practicable, it would be more convenient to have the tightening-gear at the top, so as to avoid the variation between the elevator-buckets and the boot itself.

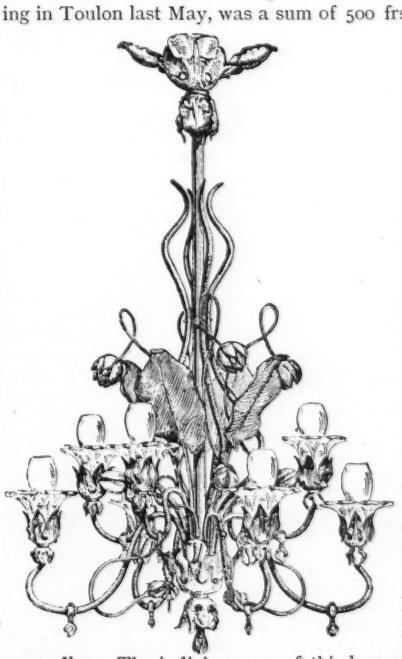
The author of the paper, in reply, pointed out that this top arrangement might interfere with the driving band or chain, unless the latter ran at right angles to the elevator. Everyone who has had to work elevating plant does not need to be reminded of the importance of the boot and its adjustment, nor of the troubles that often arise from its becoming choked-up. To remedy this, several suggestions were made. In Mr. S. W. Porter's experience, it had been found a good thing to leave the tightening gear at the elevator bottom; but, instead of raising and lowering the chain-wheels, to move the boot itself bodily up or down as found necessary. A space of 1 inch was allowed between the buckets at the lip and the bottom plate; and the boot was guided between brackets and controlled by tension screws. Thus, whatever the tightness or slackness in the elevator chain might be, the relative position of the buckets and casing was always the same. To avoid the waste of power and the wear and tear caused by the dredging action in the elevator boot, it was a good practice to feed the material at a point about 2 feet above the bottom of the elevator, the buckets of which should meet the coal or coke in rising, and not, as was often the case, at the curve of the boot. As regards coke—that most troublesome of all materials to be handled in gas-works—Mr. J. W. Helps, of Croydon, was of opinion that, as the amount of breakage was such an important matter, it was really advisable to do away with the boot altogether. There will, no doubt, be a great many engineers with experience in coke elevating and conveying plants who will agree very decidedly with Mr. Helps on this point. In fact, it may be said that, where it is possible to dispense with any elevators for coke, and to adopt in their place inclined conveyors or other arrangements, it is certainly the best policy to do so.

In spite of all the recent improvements and experiments that have been made, gas engineers are still on the look-out for a really acceptable and successful conveyor for dealing with both hot and cold coke; and it may also be remarked that the introduction of new machinery for retort-houses still further unsettles and complicates the question. Are developments being sought along correct lines, or is the solution to be discovered by some entirely different means? Whatever the final upshot may turn out to be, there are one or two hints, partly suggested by the discussion under review, that must certainly not be overlooked. The first concerns the frequent temptation to accept a cheap plant, regardless of stability, strength, and weight. "As users," very truly said one speaker, "if engineers had not had practical experience of their own, they were almost entirely in the hands of the manufacturers; and then the danger was the liability to take the lowest-priced plant, with the result that the wear and tear was found to be extremely heavy." A second point is the frequent desire to get a conveyor to be suitable to perform more than one duty, and to carry more than one class of material. An instance of this in gas-works is the utilization (?) of the return-chain of a coke-conveyor to carry coal for retort charging, or, again, to carry furnace ashes from a subway. The latter is more frequently done where tilting-bucket conveyors have been installed. But the speaker (Mr. W. H. Patchell) we have already quoted thought the plan open to criticism. "It was impossible to get the ash-buckets clean after carrying wet ashes; and to use them in the way recommended seemed like getting the dustman to deliver bread. Another essential item is lubrication. Spend money upon it, and have plenty of it, and the best of it. "Thick grease, with automatic drop-pistons fitting into the caps of the bearings, gave the most satisfactory lubrication for rollers."

We could state other important items for consideration—such as the proportion of power required, &c.—but enough has been said to convey an idea of the drift of the discussion, as it chiefly concerned gas engineers, and also to suggest a few thoughts on a subject of daily and increasing importance.

FRENCH ARTISTIC LIGHTING APPLIANCES.

AMONG the awards for artistic gas-fittings, made by the Committee of the Société Technique du Gaz en France, at the meeting in Toulon last May, was a sum of 500 frs. to M. Potron, who submitted a number of effective lighting appliances. One was the lustre of which an illustration is given below, reproduced from the current number of the "Journal des Usines à Gaz." It is composed of several branches, ornamented with foliage in hammered copper, decorated with blended tints producing a very pleasing effect. Each branch carries a small incandescent gas-burner, enclosed in a ground-glass bulb-shaped globe—the whole not exceeding the dimensions of an ordinary 10-candle incandescent electric lamp. This little burner consumes 25 litres, or 0·88 cubic foot, of gas to give a light equal to at least 12 candles. The judicious use of this burner has allowed of the construction of an entire series of lighting appliances—such as lustres, candelabra, &c.—which have the appearance of those employed for electricity, but are very much more economical, while affording an equal quantity of light.



WATER ACTS FOR 1903.

The following Acts of Parliament relating to water supply were passed during the last session.

The Bath Corporation Water Act empowers the Corporation to construct additional water-works, including a reservoir in the parish of Marshfield for collecting the waters of numerous springs. The works are to be completed within seven years. Power is given for the purchase of any private water-works within the area. If the Corporation abstract waters to the deprivation of certain owners and occupiers of land now watered by the springs to be impounded, they are to make compensation. Metered supplies for trade purposes and to inns are chargeable at the rate of 1s. per 1000 gallons. The Corporation can borrow £15,000 for land and water purchase and compensations; besides two separate amounts of £2800 and £24,200 for particular works.

The Belfast Water Act confers further powers upon the Belfast City and District Water Commissioners, chiefly in respect to their Mourne scheme of supplying the city with water from the Kilkeel and Annalong rivers, by means of an aqueduct 40 miles long. The Act has a very long preamble, reciting the circumstances in which the Commissioners now find themselves in regard to the scheme, which has cost much more money than was expected. Authority is given for the borrowing of £70,000 additional capital; and payments into the sinking funds relating to the Mourne scheme are postponed for ten years. The Kilkeel storage reservoir is to be altered. Unoccupied buildings are not to be rated, and incoming tenants are only chargeable as from the month of their entry. Assessments are subject to revision.

The Bradford Corporation Act has a part relating to water-works. It authorizes the construction of a service reservoir situate at Hartshead Moor Top, in the parish of Clifton, and of works to catch the waters of two springs. Certain portions of the authorized works are to be abandoned. The sum of £2600 is required for water-works purposes, repayable in sixty years. The Corporation have power to raise money by the issue of bills.

The Bury and District Joint Water Board Act authorizes the construction of additional water-works, comprising three reservoirs on the Scout Moor or Dearden Brook, and other works wholly situate in the parishes of Ramsbottom and Walmersley-cum-Shuttleworth, in Lancashire. Compensation water is to be provided according to a specified scale. Twelve years are allowed for the construction of two of the authorized reservoirs, and five years for the third. The compulsory powers for the acquisition of land must be exercised within seven years. The rates for domestic supplies range from £10 to £6 13s. 4d. per cent. Water-rates are recoverable as civil debts under the Summary Jurisdiction Acts. Supplies for all purposes may be by measure, at the maximum price of 2s. per 1000 gallons. For the borough of Haslingden, a well and special main are to be provided, so as to give a supply at a level of 900 feet above Ordnance datum. The works sanctioned involve an outlay of £195,000, besides £60,000 for general water-works purposes—repayable in sixty years. Members of the Board are not now required to be members of the constituent authorities. The enactments excepted from repeal are set out in a schedule.

The Ebbw Vale Improvement Act contains a clause authorizing the Nantyglo District Council to borrow the necessary sum to pay off the cost of promoting the Nantyglo and Blaina Water Bill.

The Harrogate Water Act is to authorize the transfer of the Knaresborough Water-Works to the Corporation of Harrogate, with the object of the Corporation affording Knaresborough a purer supply. The outstanding debt on the works amounts to £7544, and the cost of connecting up the mains of the two undertakings will be £2455. The terms of the transfer are scheduled. The Act authorizes the extension to Knaresborough of the Harrogate water supply system and statutes; the Corporation being responsible for paying off the water loan. The waters of the River Nidd are to be abandoned as a source of supply, for the reason that the intake is situated below the site of the authorized sewage disposal works of the Corporation. Additional water capital to the amount of £10,000 is required, repayable in forty years.

The Hyde Corporation Act contains several clauses relating to water. Owners of dwelling-houses not provided with a proper and sufficient supply of water are liable to a penalty of £5 and a daily penalty of 40s. Public drinking fountains may be provided by the Corporation, and a fine of 40s. is recoverable from persons who improperly use or foul the water. The Corporation may require the renewal of defective service-pipes. Provision is made against the fouling of the source of supply. Byelaws may be made for the cleaning of cisterns.

The Leigh Corporation Act has a part relating to water. The Water Joint Committee for Leigh and Hindley is dissolved between the Corporation and the District Council, according to the terms of an award by Mr. Joseph Parry, which is scheduled and confirmed. Water is now obtained in bulk from the Liverpool Corporation. An additional service reservoir is authorized, to be completed in seven years. Rates for domestic supplies range from 10 to 6 per cent., with no charge for the first water-closet. The maximum price of water sold by meter is 2s. per 1000 gallons. Certain mineowners are protected by exemption from the Water-Works Clauses Act, 1847. The sum of £30,000 is required for new works, and £15,000 for general water-works purposes.

The London County Council (General Powers) Act contains clauses dealing with the street works of certain Metropolitan Boroughs, with reference to the moving of gas and water mains.

The Merthyr Tydfil Urban District Council Act extends the limits of supply of water to include that part of the parish of Vaynor, in the County of Brecon, which is outside the borough. Metered supplies are to be charged at the rate of 1s. per 1000 gallons. Premises left unoccupied for seven days may be entered for the purpose of cutting off the supply. Houses may also be entered for inspection. Additional land is required. The sum of £84,000 is to be borrowed for new works, and £18,000 for general water-works purposes.

The Nelson Corporation Act extends by ten years the time for the construction of certain water-works authorized by the Nelson Local Board Act, 1888. The sum of £15,000 is required for the completion of the works in question, and £10,000 for general water-works purposes.

The New Hunstanton Improvement Act contains a part relating to water. It extends the water limits defined by the Act of 1897. The fee-simple of certain leased lands is to be acquired, and additional works are to be constructed within five years. A supply of water for domestic purposes does not include swimming baths. Farms may be supplied by measure, the maximum price being 1s. 6d. per 1000 gallons. Public fountains may be provided. Additional water capital is required to the amount of £12,000.

The Scunthorpe Urban District Water Act authorizes the substitution of other works for those sanctioned in 1899, with respect to a source now found to be unsuitable. A pumping-station and catchment are to be constructed in the parish of Roxby-cum-Risby, subject to provisions for the protection of the landowners, and to be completed within five years.

The Sheffield Corporation Act sanctions the construction of a new pipe-line from Derbyshire to the Rivelin lower reservoir. The erection of temporary hutting accommodation is permitted. Certain authorized works are to be abandoned. Power is given to the Corporation and the Derwent Water Board to enter into mutual agreements for the execution of works. Easements may be acquired for purposes of surveying for any authorized work. The charges for supplies to any premises occupied by caretakers may be adjusted. The borrowing powers of the Corporation for water-works purposes are increased to £1,289,108. Certain agreements are scheduled and confirmed.

The Sutton District Water-Works Act authorizes the raising of £150,000 additional capital, in £50 lots, with one-fourth borrowing powers. One-half of the money is to be applied to water softening. A well and pumping station are to be made in the parish of Woodmansterne, with connection to a service reservoir at Banstead. From and after Aug. 1, 1906, all water delivered by the Company to existing consumers is to be softened by Clark's or by some equivalent process to a maximum hardness of 9°. In case of default by the Company under this section, any local authority concerned may apply to the High Court of Justice for a mandatory order to enforce compliance. The new works must be completed within six years. Water is not to be sold in bulk out of the Administrative County of Surrey. If the pumping operations of the Company cause any diminution in the supply obtainable from the well at the Cane Hill Asylum of the London County Council, the Council may call upon the Company to sell them such water as may be required for the use of the Asylum, up to 100,000 gallons, in any one day, charging for the same the actual cost of raising the water. Water is to be sold for public purposes at the rate of 7d. per 1000 gallons. It is to be supplied for trade uses, by measure at the price of 10d. per 1000 gallons, to premises not more than 400 feet above Ordnance datum.

The Torquay Corporation Water Act sanctions the construction of a reservoir at Trenchford, in the parish of Hennock, taking all the waters of the Beadon and Kennick streams. It is to be completed within ten years. Main roads may be made on lands to be temporarily occupied for the purpose. In the case of fire at Newton Abbot, the district mains are to be immediately connected to the trunk mains from the watershed. Premises may be entered for inspection, or, after standing empty for seven days, for cutting off pipes. Waste-preventing appliances may be used, and roads broken up for the purpose. The sum of £22,000 is required for new water-works.

The Winchester Water and Gas Act consolidates and converts the Company's capital into 5 per cent. stock, with permission to raise £75,000 additional capital, with one-third loan. The water limits are enlarged to take in several parishes in the rural district of Winchester, the supply in which is to be made effective within five years, or the powers will lapse. Special terms are to apply to the supply of water by measure for trade purposes. A clause defines the valuation of premises for which water-rates are chargeable. Water may be sold in bulk beyond the limits of the Act.

Mr. J. Fletcher Moulton, K.C., M.P., has been elected President of the Junior Institution of Engineers, in succession to Colonel Edward Raban, C.B., R.E.

It is announced that Mr. Jesse Hall, the veteran Gas Manager at St. Andrews, has resigned his position as Chairman of the St. Andrews School Board, of which he has been a member since its institution in 1873.

PERSONAL.

Mr. Alexander Wilson to have the Glasgow Appointment.

We are pleased to be in a position to announce that the Gas Committee of the Glasgow Corporation, at a meeting held yesterday, decided to recommend Mr. Alexander Wilson, the Manager of the Dawsholm and Temple Gas-Works of the Corporation, for the position of Chief Engineer and General Manager of the Gas Department, in succession to the late Mr. William Foulis, at a salary of £1000 per annum. The names given in the "JOURNAL" for the 29th ult. were submitted to them by the Sub-Committee who had the matter in hand; and the above decision was come to by a majority of ten. The minority of six were in favour of the names of Mr. J. H. Crowther and Mr. Hubert Pooley being also put forward. Mr. Wilson has already displayed considerable capability as a Gas Engineer, and, moreover, he must necessarily be conversant with the views of his late lamented chief in regard to the future of the undertaking; and we venture to express the hope that the recommendation of the Committee will be unanimously acquiesced in when it comes before the Town Council for confirmation on Thursday. We cordially unite with the members of the profession who gave Mr. Wilson testimonials, in wishing him success.

Mr. JAMES BROWN, who has for some time been discharging the duties of Manager of the Larkhall Gas Company, Limited, has received the appointment.

Mr. W. H. SAINSBURY, Assistant-Secretary to the Banbury Gas Company, has been appointed Secretary to the Truro Gas Company, in succession to Mr. R. G. Greenaway, who has left to take up the managership of the Bodmin Gas-Works.

At St. Mary's Church, Scarborough, last Saturday, the marriage was solemnized of Miss Edith Bland, eldest daughter of Mr. Councillor Bland, and Mr. ALFRED BASS TOBEY, the Manager of the Durham Gas-Works, son of Mr. Henry Tobey, of Malton. After the ceremony a reception was held.

We understand that Mr. E. ROLLINGS will not, as stated last week, leave Nottingham to take the position of Superintendent of the Rochester works of the Rochester, Chatham, and Strood Gas Company, having been appointed Superintendent of the Basford station of the Corporation. The next candidate on the list, Mr. J. W. MAY, of Maidstone, has obtained the post.

With the end of the present week will terminate the connection of Mr. OLIVER W. PECK with the Richmond Gas Stove and Meter Company, Limited, through his preferment to the position of Joint Managing Director of Robert Sorby and Co., Limited, Edge-Tool Manufacturers, of Sheffield. Mr. Peck has been representing the Richmond Company in London and the Eastern Counties for rather more than five years.

Mr. J. M. CAMPBELL, who for the past five-and-a-half years has been Assistant to Messrs. Stevenson and Burstal, Consulting Engineers, of Westminster, has been appointed Clerk of Works in connection with the new tank and three-lift gasholder to be constructed and erected for the Devonport Corporation. He was previously, for over three years, at the Luton (Beds.) Gas-Works, under Mr. W. R. Phillips, prior to which he was in the service of the Barrowfield Iron-Works, Limited, of Glasgow. Mr. Campbell holds certificates in Applied and Theoretical Mechanics, Steam, Gas Manufacture, &c., and was the initiator (by his letter to the "JOURNAL" of July 1, 1902) of the movement which resulted, with Mr. Walter Grafton's able co-operation, in the formation of the London and Southern District Junior Gas Association, of which he occupies the position of Senior Vice-President.

It is not given to many men to complete fifty years in the service of one undertaking, and therefore some special interest attaches to an event in connection with the *personnel* of the Imperial Continental Gas Association which we have pleasure in recording to-day. Last Saturday, Mr. WILLIAM WOLVERLEY DRORY, the Manager at Frankfort-on-Main, and the Senior Engineer, celebrated the fiftieth anniversary of his entry into the service of the Association. Mr. Drory was appointed as pupil engineer at Lille in October, 1853, at the age of eighteen, and subsequently became Assistant-Engineer there. He was temporarily appointed Manager at Frankfort in December, 1860; and, as his appointment in that capacity was made permanent in March, 1861, he has for more than forty-two years occupied this responsible position. Moreover, since the retirement in 1892 of Mr. Gogel, the Association's Agent at Frankfort, Mr. Drory has been the general representative of the Association in that city. In commemoration of his jubilee, the Board have presented him with a gold chronometer, with the following inscription: "Presented to William Wolverley Drory, Esq., Manager at Frankfort, by the Board of the Imperial Continental Gas Association, in grateful recognition of fifty years' valuable services rendered by him to the Association. October 10th, 1903." This presentation was made to Mr. Drory personally by the Chairman (Mr. J. Horsley Palmer), who, accompanied by another of the Directors (Mr. C. Pigou), is travelling on a tour of inspection. Mr. Drory's colleagues, both on the Continent and in London, have also presented him with a handsome testimonial as a proof of their affection and esteem.

TECHNICAL RECORD.

AGRICULTURAL VALUE OF GAS LIME.

At a Meeting of the Monmouthshire Chamber of Agriculture, held last Wednesday, at the King's Head Hotel, Newport, a paper on "Uses of Gas Lime for Agricultural and Horticultural Purposes" was read by Mr. CHARLES D. PHILLIPS, J.P., one of the Directors of the Newport Gas Company. After briefly introducing the subject, the author proceeded as follows.

Gas lime, as I suppose everyone knows, is simply lime used for removing from crude coal gas sulphuretted hydrogen and carbonic acid; and when it is more or less impregnated with these and some other impurities which deteriorate the illuminating power of the gas, it is put on one side for the use of farmers. As it can at the present time be had at the Newport Gas Company's works, for hauling away without any charge, I am sure it is well worth attention, as it contains, properly used, the useful essentials of lime itself for agricultural and horticultural purposes. It used to be sold at the gas-works here at 1s. 8d. per ton; and it is now sold, as I see by the "Field" newspaper, as high as 2s. 6d. per ton in some parts of the country. The Secretary of the Newport Gas Company informs me that, in the event of anyone requiring it for different parts of the county, or, in fact, anywhere by rail, where it is inconvenient to haul it from the gas-works, it shall be loaded into trucks at the cost price of the labour of 1s. per ton. I am hauling it myself regularly.

To be successful in the use of gas lime, and to save disappointment, it must, of course, be judiciously employed. It cannot be compared for a moment with farmyard dung for every crop or with concentrated fertilizers, such as artificial manures of various kinds; but it is valuable as an insecticide, and also for its mechanical action in liberating other constituents, and making heavy or clay land friable. From my own personal experience, and that of many more agriculturists and scientists of much more ability than myself, I can state confidently that gas lime, when properly applied, is of great value to some lands under favourable circumstances; in fact, it renders stiff clay land porous, and, on the other hand, consolidates sandy soils, and particularly benefits grass, clover, lucerne, peas, beans, vetches, and turnips. It will destroy coarse grass, kill moss, heath, feather grass, and insects. Upon peaty land, it is highly recommended. I have particulars supplied by Mr. Wilson, of Largs, in which he gives a very interesting account of ten different plots treated with various manures, in which gas lime comes out very creditably. The plots were 20 perches each. Plot No. 3 was treated with a ton of gas lime in the proper season for a hay crop, and it produced 5208 lbs. of hay per acre; while in the case of No. 1, left untouched, the result was 3360 lbs. of hay to the acre.

I have been looking through the various leaflets of the Board of Agriculture (and I may here remark that I believe the Monmouthshire Chamber of Agriculture has circulated to its members more of these very useful publications on various matters connected with agriculture than any other Chamber in the kingdom), and I find many instances in which gas lime is specially mentioned and recommended. The following are some of the good purposes served by gas lime.

Poultry Disease.—Poultry keepers suffer great loss through liver disease of poultry. When this appears, and the infected birds are got rid of, the house should receive several applications of a thorough disinfectant, and the tainted poultry-run should be heavily dressed with gas lime. Then in cases where the birds have suffered from the gape worm, the run should be purified, after an outbreak, either with gas lime or a solution of sulphuric acid.

Carrot Fly.—In cases of various insect pests (for instance, the carrot fly), after an infested carrot crop has been removed, the land should be trenched in gardens, and very deeply ploughed in fields. A dressing of finely-powdered gas lime should be applied before the land is dug or ploughed in the ordinary way.

Chafer Beetles or White Grubs.—These insects are more or less abundant in the majority of districts in Great Britain, and in the grub state the damage they do is often very serious. As "top dressings," when the grubs are working in the soil, gas lime and kainit have been found of benefit. On pasture land, where the attack is worst of all, a heavy dressing of gas lime has frequently been used, and is found to kill the grass and the grubs. This seems too drastic a measure; but if any good is to be effected, it must be done thoroughly, and the grass will grow strongly the following year.

Codling Moth.—This is a very small moth, but its caterpillars are, in most seasons, exceedingly destructive to apple crops. "Windfalls" or "drops" must be cleared away as soon as possible, and should be disposed of at once. If not fit for sale, they should be given to pigs. Where cider is made, the ground where apples have lain in heaps should be well gas-limed and dug deeply, and all rubbish near burned.

Wire-Worms.—These are popularly known as "click beetles" or "skip jacks." Hardly any crop is free from wire-worm ravages. Corn, roots, and vegetables of all kinds suffer in turn. Gas lime,

lime, and salt, so often recommended, have no definite effect upon them in the ground; but gas lime now and then seems to act as a deterrent, and may be used with advantage on infested land prior to its being broken up. The lime must be left on the surface at least four weeks before it is worked into the land. The quantity depends entirely upon local conditions, soil, &c.

Winter Moths.—In the case of cultivated fruit land, many of the chrysalides might be destroyed by digging or hoeing (late in the summer) the ground all round trees that were infected in the spring, and by digging or hoeing in lime or gas lime.

Surface Caterpillars.—These cause injury to many crops of the garden, market garden, &c., and particularly to mangolds, turnips, and potatoes. To prevent a recurrence of an attack from these pests, it is desirable to use on infested fields gas lime finely powdered, and to plough deeply.

Root-Knot Disease in Cucumbers and Tomatoes.—Cucumbers and tomatoes are often affected by a disease induced by the root-knot eelworm. One remedy in destroying eelworms is mixing gas lime intimately with the soil.

Finger-and-Toe in Turnips.—This disease (known also as anbury, club root, and "grub") attacks most crops, such as turnips, swedes, cabbages, kohlrabi, rape, radishes, &c., and often proves very destructive. The cause of the trouble is a fungus so small as to be perceptible only by the aid of a strong microscope. Although this disease is widespread and destructive, much may be done to limit its ravages. It is practically unknown on soils naturally containing a high percentage of lime. The artificial application of burnt lime has long been practised as a preventive; and this substance is still the most effective agent known. Other forms of lime are more or less effective, though none is so powerful as common burnt limestone, which is subsequently slaked before spreading. If gas lime is employed, it should not be put on later than 18 months ahead. Used in this way, at the rate of 3 to 4 tons per acre, it has, first of all, the opportunity of increasing the yield of the corn crop, and in the following year it gets the chance to act on finger-and-toe.

The foregoing, as I have already mentioned, are from one of the Board of Agriculture's leaflets; but the late Dr. Augustus Voelcker, Professor of Chemistry to the Royal Agricultural Society of England, nearly forty years ago made the following important statement*:—

> On land naturally deficient in lime, turnips often refuse to grow, or, if they grow at all, produce but a scanty crop, which is, moreover, very liable to be attacked by a disease known to farmers as "fingers-and-toes." A large dose of gas lime applied to the stubble land in the autumn, before it has been turned up by the plough, in many instances is an effectual cure for this disease. An interesting instance of the prevalence of "fingers-and-toes" in a turnip crop grown on a light, sandy soil, and the complete cure of this disease by a liberal application of gas lime, was brought under my notice some years ago. On visiting the field where the turnips were affected by wart-like excrescences, and forked and twisted into the most fantastical forms, I noticed a spot on which the roots were nearly all sound. On stooping down and examining the soil, I picked up some bits of a whitish-looking substance, which appeared to me like dried gas lime; and I learned afterwards that on this very spot a cart of gas lime had been unloaded the year before. The chemical examination of the soil on this field showed merely traces of lime; and at my recommendation, the occupier applied a heavy dose of gas lime, which completely cured the evil. With regard to the quantity of gas lime which ought to be put on the land, no general rule can be laid down; for the quantity should be regulated by the relative deficiency in calcareous constituents which different soils exhibit. Speaking generally, however, two tons per acre may be used with safety, and, in many instances, a heavier dressing will not be amiss.

The late Dr. Voelcker's son, the present Professor, in a letter to me, says: "Gas lime is excellent for destroying weeds or foul land, and for killing parasitic pests, &c. Hence it is good for stopping finger-and-toe in roots."

Now, with regard to the composition or analysis of gas lime, I have it here on excellent authorities; but I think it unwise to enter into the chemist's scientific point of view of the subject, but rather to confine my remarks to the intelligent uses of gas lime as affecting the land. I received a letter some time ago from Captain Forestier-Walker, in which he stated that last winter a considerable quantity of gas lime was put on a field at Cleppa Park with the most beneficial results. The field had been very much overdone with sheep for years, and from about last April he had a lot of half-bred colts on it and some Kerry heifers; and they have both done remarkably well. He sees great improvement in the quality of the grass. He intends, when the horses and men are less busy in the autumn, to get a considerable quantity of the gas lime to dress other fields, and will very gladly avail himself of the opportunity of getting it from the gas-works free. Mr. Richard Stratton has also written to me to say that he is glad to hear that gas lime can be had at the works free of cost. He thinks it should be freely employed by farmers on these terms, as it is undoubtedly a useful manure on all kinds of land, but must be used with discretion, as, if applied in its crude state to growing crops, it will destroy them. It should be put on to grass land in the winter, and would be best mixed with earth and applied as a compost.

Now, gas lime will, of course, if spread over the young tender blade, just beginning to grow, do great harm, and partially or wholly destroy it; but it should be sown in the winter, when there is no growth of vegetation, and after the lime has been well exposed to the atmosphere for several months. In fact, it really ought to be hauled, and exposed to the atmosphere for some eight or ten months, before it is applied; and where earth can be procured to mix with it to make it into a compost, it might probably be applied in less time than that, and not put on one side so long, as it could, as a compost, be more evenly distributed.

Gas lime sown in the fall on grass land, and a sprinkling of salt early in the spring, have been found to improve pastures. You will always find animals select patches where gas lime and salt have been used in this way; and I think that cattle are the best judges of quality. With regard to arable land, a dressing should be made as long as possible before the crops are sown; and the application should be left spread on the surface of the land for some time before being turned or ploughed in, contrary to the treatment to which caustic lime should be subjected.

I do not think, with the present opportunities of obtaining gas lime, that a single cartload should be left in the gas-works with agricultural country surrounding. By the adoption and proper application of it, agriculturists and horticulturists, will be taking it from the place where it is of no value to the land where it is of real value. Gas lime is most invaluable for preventing foot-rot in sheep, or, when they are dressed in the pen for foot-rot, for destroying the germs that are cut away from the sheep's feet. It is also useful for "hoof" in cattle, by being spread about the yards. There is no doubt that a very good plan for preventing foot-rot would be to have a good bed of gas lime hurdled in for the sheep to walk through occasionally.

I have spent some time in considering this matter for the purpose of inviting discussion, either for or against gas lime. My thanks are due to Dr. J. Augustus Voelcker, to Mr. Morley, the Engineer and Manager of the Cardiff Gas-Works, to Mr. Canning, the Engineer and Manager of the Newport Gas-Works, and to Mr. W. J. Grant, Organizing Agent and Lecturer for the Monmouthshire County Council.

I think it would be of great assistance if those present who have any knowledge or experience with regard to the uses of gas lime will give us the benefit of it. At all events, I am sure it is worth while to those who have not done so to make a trial of gas lime; and perhaps at some future time they may be good enough to give the other members the result of their experiences.

In conclusion, I trust the consideration of this paper may serve a doubly useful purpose—first, by agriculturists, horticulturists, and poultry keepers getting the benefit of an article they can have for simply fetching it away; and, secondly, by the Gas Company being relieved of a useless commodity to them, which now occupies a valuable portion of their extensive works.

* See "JOURNAL," Vol. XIV., p. 210.

NOTES ON GAS PURIFICATION.

The Discussion on Dr. Bunte's Paper.

A discussion ensued on the delivery by Dr. H. Bunte of the lecture which formed the basis of the paper of which a translation has now been published.* We give below a summary of the more important remarks, and of Dr. Bunte's reply.

Dr. Leybold, the Chemist at the Hamburg Gas-Works, opened the discussion by tendering the thanks of all present at the Düsseldorf gathering to Dr. Bunte for his instructive lecture. Turning to the points raised therein, the speaker made some observations on the process of purification. For many years, the simple explanation of the action of oxide of iron had been wanting, and in the older text-books on gas manufacture there were given numerous complex formulæ for different sulphides of iron which were supposed to be produced. It could, however, be readily demonstrated that there was only a simple conversion of the ferric hydrate into iron sulphide and sulphur. If the fouled material as taken from the vessels was protected from the air and extracted with carbon bisulphide, the free sulphur obtained thus from it showed the correctness of this view of the reaction which had taken place. Moreover, the degree of revivification of fouled oxide could be ascertained simply by measuring the volume of sulphuretted hydrogen evolved when the material was decomposed with hydrochloric acid. This proved that ordinary sulphide of iron is present as well as sulphur.

Recently revivification had been effected in the vessels by adding some air to the gas. It was strange that the more complex process of adding oxygen preceded the method of simply adding air; but actually apparatus for producing reasonably pure oxygen was installed in many gas-works in England—*e.g.*, Ramsgate—and oxygen itself was mixed with the gas. It was after this had been done that it was realized that the air, which could be had cheaply enough, would perform the same service. Then the method of adding air was adopted pretty widely; but, unfortunately, some mistakes were made. Up to about 2 per cent. of air might be added without injuring the process of purification; but unsatisfactory results ensued if this proportion were much exceeded. There was the temptation to save in gas made by adding as much as 3 to 3½ per cent. of air; but if this were done, though the purifiers would run for eight or nine months without being opened, it would be found on opening them that the material was hard, caked together, and as dry as dust, and required to be hacked out with picks. This work was difficult; and it would be found practically impossible to get the

* See "JOURNAL," Vol. LXXXIII., pp. 676, 749, 812.

material to take up moisture again so as to become fit for further use. Furthermore, the proportion of cyanogen in the material would be very small; whereas air amounting to as much as 2 per cent. of the volume of gas did not interfere with the proper absorption of cyanogen. If this proportion were much exceeded, more than half of the cyanogen in the gas would be lost.

In connection with the admission of air to purifiers, there were some attendant evils which had to be borne in mind. The gas-meters, for instance, suffered corrosion to a slight extent only if the air supply did not exceed 2 per cent., but very greatly if it were much higher. It appeared that the oxygen of the air admitted was never completely taken up by the material; but that a small proportion invariably passed through the vessels. The corrosive action of the hydrocyanic acid in the gas was greatly increased through the presence of oxygen. It was therefore necessary to restrict as far as possible the amount of air admitted to the purifiers.

Dr. Bunte had, he said, pointed out that the proportion of carbonic acid in the gas had little effect on the light yielded in incandescent burners. It had been commonly observed that when upwards of 30 per cent. of carburetted water gas was added to coal gas, the light given in incandescent burners was not diminished, notwithstanding the higher proportion of carbonic acid, and the consequent reduction of combustible constituents, brought about by the addition. On the other hand, if water gas, carburetted in any way, were used in ordinary incandescent burners without admixture, the conditions were completely altered. The specific gravity was higher than that of coal gas, and the nipples and air inlets of the burner were not suitable; so that, as a consequence, the light afforded in such burners showed a considerable decrease. But by using suitable burners, or widening the nipples and regulating the air inlets, it was easily possible to obtain the original light, or even to surpass it.

As to the sulphur compounds in gas, they had in many cases caused great trouble. The destruction of book bindings in London was many years ago traced to sulphuric acid; and a limit was placed on the sulphur in gas in consequence of the high proportion of sulphur in English coals. For years the only means of reducing the sulphur in coal gas below a given limit had been by means of lime purification; and this system had been adopted. Most works in Germany were in the happy position of not having to employ this method. Most Westphalian coals, and almost all coals applied in South and Middle Germany, had a low proportion of sulphur, and the gas could be used without lime purification. But there were many English coals, which gas-works in North Germany used, which caused trouble, even though the dilution of the sulphurous or sulphuric acid in the products of combustion from the burners was such that they amounted to only some hundredths of 1 per cent., these sulphur compounds found their way with certainty to metals, and when—as for instance in gas heating apparatus—copper was employed, it was inevitably converted in time into copper sulphate, and so destroyed. Consequently, there was a certain value in keeping the amount of sulphur in the gas below certain limits. The drops observed on porcelain reflectors placed above gas-flames consisted of sulphuric acid. In order to avoid them, care should be exercised in the selection of coal, and those English coals which contained much sulphur should be dispensed with. At the time this was the best course available. Dr. Bunte's remarks about the absorption of carbon bisulphide by the heavy oils which were used for the removal of naphthalene were very interesting. The speaker had, however, among other agents, tried such oils as absorbents of carbon bisulphide, and had found that they did not absorb any considerable amount from coal gas. The action of different descriptions of heavy oils on the gas ought, however, to be further studied.

Dr. Leybold was followed by Dr. Bueb, of Dessau, who began by pointing out that air should not be added to the gas prior to the scrubbers. If air were added before the gas was scrubbed, a portion of the cyanogen present was converted into the valueless sulphocyanide. At the Warsaw Gas-Works, where cyanogen was recovered by a wet process, the yield of cyanogen diminished and the production of sulphocyanide increased to a corresponding extent when air was added to the gas. When the air was admitted after the cyanogen washers, the yield of cyanogen increased again. The Chemists at the Warsaw works had made the interesting observation that when air was admitted before the scrubbers, the ammoniacal liquor contained pyrogallic acid. It was essential, for the foregoing reasons, that the air should not be added to the gas until immediately before the purifiers. Moreover, for good oxide purification, it was necessary that the cyanogen should be removed as fully as possible from the gas before it entered the purifiers. Hydrocyanic acid decomposed sulphide of iron with liberation of sulphuretted hydrogen. Cyanogen was, therefore, directly at variance with oxide purification.

With reference to the removal of carbon bisulphide from gas, the interesting process of Pippig and Trachmann* had been given a thorough practical trial at the Dessau Gas-Works. The removal of carbon bisulphide was not, however, complete, and the process was much too costly, bearing in mind the necessity for a constant reduction in the working expenses of gas-works. If naphthalene washers had occasionally served also to wash out the carbon bisulphide, this action could only be traced to the tar bases present in the anthracene or creosote oil used, as the oils themselves would not effect it.

Herr Burgemeister, the Manager of the Celle Gas-Works, in Hanover, said that he adopted the plan of admitting air to the gas at his works in 1889. He had admitted as much as 2 per cent.; but he had observed that whenever the proportion exceeded 1½ per cent., gas-engine owners complained of bad gas. The addition of the air could be effected very simply, by taking gas at the pressure of 4 to 5 inches which prevailed after the scrubbers, and passing it through a kind of mixing jet, after the manner of a bunsen burner, which sucked in air, into the condenser inlet. This sufficed to force into the gas any desired quantity of air. The mixing-nozzle was encased, and the casing connected with a meter provided with a regulating tap, by means of which the percentage of air could be set at will. An hourly observation of this meter was made, and the tap set according to the production of gas at the time, so that from 1 to 1½ per cent. of air was admitted.

Dr. Becker, of Frankfort-on-the-Maine, referred to the deposition of water in the second purifier when air was being admitted to the gas. He had made experiments as to how it could be avoided. The vessels were usually charged with oxide containing about 40 per cent. of moisture. This was attended with deposition of a lot of water in the second vessel when 1½ per cent. of air was added to the gas. But on reducing the amount of moisture in the oxide to 30 per cent., there was no deposition of water in the second vessel. With regard to the rise of temperature on the admission of air, he had found, by means of registering thermometers, that the first vessel, if charged with new oxide, showed a rise from about 15° C. (59° Fahr.) to 30° to 32° C. (86° to 89½° Fahr.). When the freshly-charged purifier was put last, and the rise of temperature measured there, it was only from about 15° C. (59° Fahr.) to 21° C. (70° Fahr.). When the newly-charged vessel was first in the series, the rise of temperature caused much water to be evaporated from that vessel, to be deposited again in the second one. But it was not usual to work a newly-charged vessel first in the series. The speaker had adopted the plan of blowing out a newly-charged vessel into the second vessel instead of into the air, in order to save the loss attendant on the latter method. It resulted in a rise of temperature of about 6° C. (11° Fahr.) in the second vessel for a short time; but this soon disappeared, and there was no noticeable decrease in the illuminating power of the gas. As soon as the new vessel had been blown out, the valves were reversed, so as to make it the last of the series of three.

Herr Klönne said that while the addition of air to coal gas seemed very alluring, many gas managers had had very unfavourable experiences of it. This had caused him to look more closely into the matter. He had found that with a single upward gas stream through the vessel, 1 cubic foot of oxide served to purify about 6000 cubic feet of gas. With a downward stream, it would suffice for some 7000 to 8000 cubic feet. Very much better results, however, could be attained by dividing up the stream of gas. If the vessel were divided into two chambers, and the gas admitted at the middle—one stream going up and the other down—then 13,000 to 14,000 cubic feet of gas could be purified per cubic foot of oxide. This might be due to the reduced rate of flow of the gas; but he thought there was some other cause, which he believed he had discovered. They were only concerned there with the practical results; and the theoretical explanation was by no means simple. The purifying system was divided into primary and secondary purifiers, and extremely good results were thus secured. Temperature and moisture certainly played an important part. The material did not become hard.

Dr. Bunte, in giving his thanks to those who had discussed the points raised in his paper, said that he might observe that the heating of gas for the purpose of converting the sulphur compounds to sulphuretted hydrogen might be carried to as high a temperature as 600° C. (1100° Fahr.) without appreciably affecting the illuminating power. The arrangement of purifiers which Herr Klönne had described called to mind similar apparatus which was used in other industries, as, for instance, at the pneumatic malt-house at Galland. Similarly the purifying material might be charged into slowly rotating drums. Local heating would thus be avoided, and uniform fouling secured. It would be well worth while making an experiment on a large scale in order to see if the customary box purification could not be improved upon in a simple manner, and the difficulties that were attendant upon it avoided.

* See "JOURNAL," Vol. LXXXIII., p. 813.

In the "Physical Review" for July and August, Messrs. E. F. Nichols and G. F. Hull describe experiments for determining the pressure due to radiation. In order to obtain results free from the effects due to the disturbing action of gases: (1) Use was made of the most perfect reflecting surfaces to receive the radiation; (2) the action of a beam of constant intensity was studied in gases at different pressures; (3) the apparatus was arranged as a torsion balance, in such a way that the disturbing actions could in large measure be reversed; and (4) ballistic observations were made. It appears that the radiation pressure depends only on the intensity of radiation, and is independent of the wave-length, thus confirming the Maxwell-Bartoli theory within the probable errors of observation.

A SIMPLIFIED METHOD OF GAS PURIFICATION TO COMPLETELY RECOVER TAR AND AMMONIA.

The following is an abstract-translation of the short paper which, as already mentioned in the "JOURNAL," was presented by Herr Burgemeister, of Celle, at the meeting of the German Association of Gas and Water Engineers on June 26 last.

Numerous improvements have been made in gas manufacture during the last thirty years. They extend to almost all stages of the production and purification of gas; but the old arrangements are practically still adhered to in respect of the condensation and scrubbing of the gas. New and more complex machines have indeed been introduced for effecting recovery of the ammonia; but many even of these fail to accomplish their purpose so completely as they should. The author believes that he has discovered the proper method of treating the gas in apparatus which does not require either high pressure or motive power.

The following is an account of the way in which he effects this simplification of procedure. If the gas as it leaves the retort or hydraulic main is saturated with aqueous vapour, the absorptive power of the latter admits of it taking up the tar, ammonia, and other compounds which are mixed in the hot gas. Then the matters so taken up and carried by the steam are, by subsequent vigorous cooling, thrown down when the steam is condensed. The tar is thus completely separated in the condensers, as well as some of the ammonia, carbonic acid, and sulphuretted hydrogen. The tar is so entirely thrown down with the steam that there is not a trace of it left when the gas enters the tar-extractor. The steam may be introduced in either of two ways. The one is by a steam-pipe connected with the take-off gas-pipe from the hydraulic main. Between the steam valve and the mouth of the pipe a worm twisted out of sheet brass is inserted in the steam-pipe, in order to impart a rotary movement to the issuing steam, and thus ensure intimate admixture of it (before it can condense) with the gas. The second, cheapest, and probably best, way is, however, to drop water into the ascension pipes at the rate of about 80 drops a minute. The water evaporates at once in the pipes and mouthpieces; the steam mixes with the hot gas, and is drawn off with it.

The rate of supply mentioned is about twice as fast as is practised, merely with the object of preventing stoppages in the ascension pipes. In the trials, when steam was admitted directly, the rate of admission was such that the gas was kept up to a temperature of 60° C. (140° Fahr.) at the inlet to the condenser. So far as the separation of tar was concerned, the result was the same whether direct steam was used, or water was introduced in the ascension pipes. Probably rather more ammonia was formed under the later procedure, though this was not definitely proved to be the case. In the absence of steam, tar soon appeared again prior to the tar-extractor; so that the deposition of tar was shown to be accomplished by the introduction of the steam.

In order to remove the ammonia and other compounds from the gas, a washer has been constructed to take the place of scrubbers; and in it the purification of the gas is effected by means of a special water-spraying apparatus shown in fig. 1. The liquid is supplied to the apparatus through the pipe C fixed above the funnel, whence it runs through the syphon pipe B to the outlet nozzle above the stand-pipe A, and falls a suitable distance through the pipe on to the convex disc D (fig. 2), which should be fitted about 10 inches below the top of the vessel. By the force of the fall, about half the liquid supplied—whether ammoniacal or clean water—is turned into fine spray; the other half runs off to the edge of the disc, which is extended downwards vertically for about $\frac{2}{8}$ inch, and falls on the conical ring E (fig. 3), fitted a corresponding distance below the disc. About 60 per cent. of the liquid is here also converted into spray. The remainder of the liquid runs down the sloping surfaces of the cone E and falls on to the next cone, &c., where the same process is repeated, until the liquid is entirely converted into spray. The conical rings are so shaped that the whole space inside the washer is filled with spray, which would not be the case with an arrangement of plain discs. The sides of the conical rings E have at their lower ends (like the disc D) a central extension of $\frac{2}{8}$ inch, with the object of preventing the liquid running down the sloping sides of the cones and taking a slanting direction, and of causing it to fall exactly on to the middle of the next conical ring, where it is converted into spray. The conical rings are provided also with small funnel-like pieces at the bottom, to prevent the liquid which runs down the sides of the cone, from flowing on to the supports.

The washer is started at one setting of the valve C; and the apparatus then works quite regularly and uninterruptedly, and needs no further attention. The washer is patented in Germany, and patents abroad have been applied for. The supply of steam to the gas is also the subject of an application for letters patent. The washer may be employed in gas-works and coke-works, in place of scrubbers and washers, for the purpose of separating the tar and ammonia from the gas in the most perfect and simple manner, with a relatively small quantity of liquid. The washing can be done with suitable liquids, and in several pieces of apparatus one after the other. Then, in making gas, for instance, ammoniacal liquor may be employed in the first apparatus, and clean water in the later apparatus. The use of small quantities of liquid becomes possible, because it falls into the apparatus through a nozzle of only $\frac{2}{8}$ to 1 inch in diameter, and drops on to discs and conical rings arranged at such a distance under the nozzle, and under each other, that a particularly fine and complete spraying of the liquid is attained. Thus a thorough contact of the liquid with the gas takes place. The washer can also be used for throwing down dust and other impurities from blast-furnace gases, and generally for purifying power gases; also as a distributor of anthracene oil for the separation of naphthalene from illuminating gas.

In existing gas-works, the present scrubbers can easily be reconstructed by removing the grids and inserting the spraying apparatus and rings. Only one machine is necessary for diameters up to 10 feet. With these simple condensers and washers, which need no pressure and no motive power, and by supplying steam to the gas, it is possible to get rid of the whole of the mechanical apparatus, which often needs repairs and annual

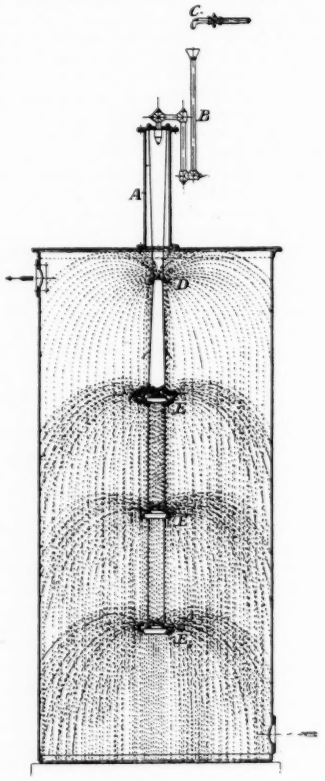


FIG. 1.

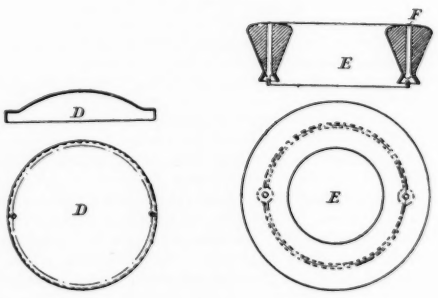


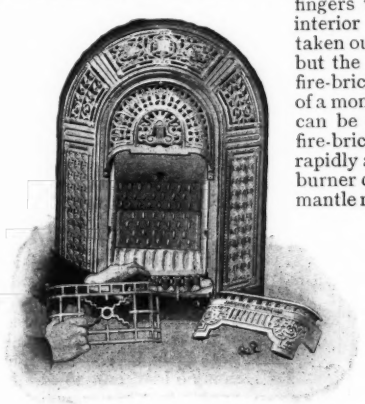
FIG. 2. FIG. 3.

cleansing and attention. The purifying of the gas becomes much simpler and more profitable, as much larger quantities of the valuable ammonia are recovered. The gain in ammonia recovered alone—amounting to 1·5 per cent. of the coal carbonized—will, in one year, not only cover the cost of the alteration, but leave a considerable surplus. At the outlet of the washer, there has never been more than 0·4 grain of ammonia in 100 cubic feet of gas. In many gas-works, the yield of ammonia may be doubled or trebled. It should be mentioned that by this process also the work of the purifiers is considerably lightened.

The results attained are not the product of laboratory experiments, but of practice. At the Celle Gas-Works, 1·2 per cent. of the weight of coal carbonized was recovered as ammonia in the form of concentrated liquor. At the town gas-works at Nienburg on the Weser, 21 lbs. of sulphate of ammonia were obtained per ton of coal carbonized. These figures may still be improved upon, and it is hoped in the present working year to get up to a yield of 1·5 per cent. in concentrated liquor.

FURTHER NEW FEATURES IN GAS-FIRES.

Several novelties are to be found among the gas-fires which Messrs. John Wright and Co., of Birmingham, have commenced to offer for the coming season, and which are bound to command attention. As we have only recently pointed out, no one with an intimate knowledge of gas-fires can do other than count the removable burner as being one of the best of the advances that have been made in this line. There is no gainsaying it is an inestimable convenience both to the gas supplier and the consumer alike. This is a matter to which the firm named above have been giving additional consideration, with the result that it is noticed that they are fitting to most of their ordinary gas-fires (among which a number of fresh designs are seen) the patent arrangement shown in the illustration. By simply loosening with the fingers two knobs, the whole interior of the stove can be taken out—not only the burner, but the removal of the whole fire-brick lining is but the work of a moment, so that the burner can be cleared and a broken fire-brick replaced almost as rapidly as an incandescent gas-burner can be cleaned and the mantle renewed, and with little, if any, more inconvenience to the user. The illustration shows the simple and complete character of the arrangement.



In other lines of heaters, the "St. David" gas-heated hot-water radiator claims mention. It is entirely self-contained, and requires neither water-connections nor flue. A patent adjustable heat regulator automatically lowers or turns up the gas as the temperature of the water rises above or falls below the point desired. The radiator is made in six sizes. The "St. Andrew," practically of the same construction, is offered in the form of a gas-heated steam radiator, and is fitted with an automatic valve to regulate the heat and economize the gas. This apparatus is also complete in itself, and needs neither water-connections nor flue.

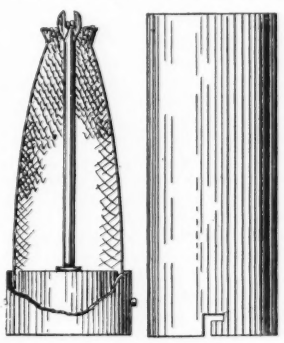
It has more than once been a matter of remark in the "JOURNAL" that very awkward contrasts sometimes occur when a gas-fire of one style and design is placed before a grate of quite another style—this often producing a want of harmony and a sense of makeshift in the whole arrangement. A somewhat striking means of overcoming this difficulty is embodied in the "Sovereign." It is the working parts of an ordinary gas-fire set into a copper *repoussé* screen, large enough to conceal the entire front of the coal-grate against which the fire may be placed. This contrivance at the same time simplifies the fitting-in of the fire; all that is needful being to lift out the front bars of the grate, and push the stove as far back as it will go, then connect up the gas and flue-pipe. The *repoussé* design is a pleasing one, and altogether the "Sovereign" is an apparatus worthy of attention, especially by those who value harmonious home surroundings. A cheap and effective nursery fire is the "Commodore," which embodies all the latest improvements, and has a boiling-burner on top, controlled by an independent tap. The "Grandee" is a new radiating gas-stove, which burns with a luminous flame, and should be found useful for heating shops where no flue is obtainable, and where it is not desirable to go to the expense of a condensing-stove. It is made in three sizes.

We have gone to a sufficient length to show that Messrs. Wright and Co. have been busy preparing for the approaching heating season; but the new features of their productions here noticed are only examples, and do not by any means represent the total.

Appreciation of the "Wrinkle Department," which, as our readers are aware, is a feature of the Gas Managers' Associations on the other side of the Atlantic, is expressed in the current number of the "Electrical Times." Our smart little contemporary, which appeared originally as "Lightning," points out that in America—where, it is said, gas managers are less conservative than they are here—"the gas manager is always on the look-out for something new, and when he evolves a new dodge he doesn't keep it to himself either. He writes out a short description in choice Americanese, draws a rough diagram if necessary, and mails his notion to the Wrinkle Department of whatever Gas Managers' Association he happens to adorn. Thus his colleagues get the benefit; and when they reciprocate, he gets a benefit too." The suggestion is thrown out that the engineers of electric light stations might give their colleagues the advantage of any "artful little ways" they may hit upon of getting over or round difficulties, and which may not be important enough to read a paper about.

CARRYING MANTLES FOR STREET LIGHTING.

Mr. Victor Rettich, of the Kern Incandescent Gas-Light Company of New York, whose article dealing with American Gas "Arc" Lamps was noticed in the "JOURNAL" for Aug. 11 (p. 358), has forwarded the accompanying sketches of a device for carrying mantles for street lighting purposes, which he thinks may prove a useful adjunct to Mr. Carpenter's patent lift-off incandescent burner head and mantle protector, which was described in our issue dated June 30 (p. 969). The illustrations fully explain themselves; the appliance simply consisting of a removable cover for the mantle protector, which encloses the mantle until it is securely placed on the burner. This arrangement, Mr. Rettich remarks, may be convenient for the use of non-collodionized mantles.



THE ACTION OF THE INCANDESCENT MANTLE IN THE FLAME.

The following is an epitome of a lengthy communication by Dr. C. Killing, of Düsseldorf, to a recent number of the "Journal für Gasbeleuchtung," on the theoretical basis of incandescent gas lighting.

The author begins by referring to his earlier work on the same subject, as already reported in the "JOURNAL" (Vol. LXVIII., p. 1128), and to the development of the theory of catalytic action by Dr. Bunte in 1898 (Vol. LXXI., p. 398). After recapitulating the grounds on which that theory rested, he proceeds to give an account of his recent work. He describes some alterations which he made in the Junkers calorimeter when using it in connection with experiments on incandescent mantles. The gas passed from the pressure regulator to the experimental gas-meter, and then into a Woulff's bottle, which was provided with a thermometer as well as the inlet and outlet pipes. From this bottle it passed to the incandescent burner, which was so placed under the calorimeter that the whole of the mantle was visible, while the part of the chimney extending above it was pushed into the calorimeter. The only other alteration which appeared desirable was in the pipe, which is transferred during use from the funnel to the measuring cylinder and *vice versâ*. This was fitted with a three-way cock, which, at the moment when the hand of the meter passed the zero point, was turned, and thereby altered at once the direction of the water outflow. This appeared to be an advantage over the old method, in which the water-pipe, containing air as well as water, was raised and lowered. A test was carried out only when the thermometer in the inflowing water had remained steady for a few minutes.

The incandescent gas apparatus, which was made by simply screwing an incandescent burner with a cone and steatite ring on to the foot of an ordinary laboratory bunsen burner, always had to be kept in the same position. For this purpose a line was drawn with chalk round the foot, and the burner was always replaced within it. When the mantle had to be changed, the burner top and chimney were pushed up into the calorimeter, and the burner foot was drawn away. Then the burner top, with mantle and chimney, could be taken out. With such an apparatus, one part of the total energy in the gas is taken off by the products of combustion into the calorimeter, and this part can thus be measured; a second part is emitted as radiation by the mantle; while a third part is conducted away through the burner. The latter portion varies with different burners—being smallest with steatite and greatest with metal burners.

On a certain day, with careful observance of the above-named precautions, and with an incandescent gas-burner, consuming 118 litres (4·17 cubic feet) per hour at a pressure of 35 mm. (14-10ths), the following results were obtained:—

	Calories per Cubic Metre.
1.—Morning, 8.30. Calorific power of the gas	4849
2.—With the incandescent gas apparatus, without mantle or rod	4683
3.—With the same apparatus, without mantle but with magnesia rod	4631
4.—Do., with mantle of pure thoria	4091
5.—Do., with a mantle of 99 per cent. thoria and 1 per cent. of ceria	3971
6.—Afternoon, 5.45 o'clock. Calorific power of the gas	4844

The volumes of gas were always corrected according to the formula—

$$v_0 = \frac{v}{1 + 0{\cdot}00367t} \times \frac{b}{760}$$

The water collected in the measuring cylinder was weighed, and

the heat of evaporation of the condensed water in the Junkers calorimeter was deducted. The numbers are each the mean of three determinations, which agreed with one another in so far that they did not show a difference of more than 40 calories.

If a large number of pure thoria mantles (which are practically non-illuminating) are examined in the manner indicated above, some will be found to give lower values for the heat liberated than that given above for thoria-ceria mantles; and some of the latter will show higher values than that given for the thoria mantle. The differences arise from the mantles being more or less touched by the flame, according to their shape and width, &c. The fact that thoria mantles, as a rule, give higher values for the heat liberated than thoria-ceria mantles, does not justify the conclusion that ceria has a special capacity for lowering the value of the heat liberated and increasing the radiation. As it is difficult, or even impossible, to produce two mantles alike in shape, diameter, and mesh, one of pure thoria and the other of thoria and ceria (99 to 1), satisfactory evidence as to the special activity of ceria from tests of two different mantles will never be forthcoming, even if the quality and quantity of the gas consumed are assumed to be equal.

A burnt-off mantle of pure thorium oxide can, by steeping in an alcoholic solution of cerium nitrate, be impregnated with this salt; and thus, by heating for a short time, a thorium oxide mantle coated with cerium oxide can be made. Such mantles certainly do not give the full brightness of well-mixed thoria-ceria mantles; but the greater or less brightness has not much bearing upon this question. It is possible to make a nearly non-illuminating thoria mantle give a light of 52 candles by thus coating it with ceria. Most of the present trade preparations of thoria, though otherwise pure, have a higher percentage of ceria than formerly, and this has to be removed from them for experimental work. It can be best done by precipitating several times by sodium hyposulphite. By steeping as mentioned above, the same mantle can be tested calorimetrically first as a thoria mantle, and afterwards as a thoria-ceria mantle.

If a pure thoria mantle, not too much toughened, and not having been long in use, is steeped in a solution of 0·045 gramme of iridium or rhodium chloride, in 300 c.c. of spirit, it gives a yellowish-red light of about 35-candle power, with a consumption of 4·17 cubic feet of gas at 14-10ths pressure. The brightness decreases gradually, because metals of the platinum group in such a fine state of subdivision are somewhat volatile, especially at that part of the mantle where the combustion of the gas and the development of light are the strongest. The decrease is, however, not important so far at all events as the author's present experiments are concerned.

Testings of ten different mantles of thoria, before and after coating with ceria, showed that, whereas the calorific power of the gas averaged 4983 calories per cubic metre, the heat liberated in the calorimeter with the simple thoria mantle averaged 4133 calories, and with the ceria-coated mantle 4015 calories. This indicates that the radiation of the pure thoria mantle (4983—4133 = 850) has been increased by 13·9 per cent. by the addition of ceria. Similarly, the addition of metals of the platinum group to a thoria mantle was found to increase the heat radiated by the mantle by 13 per cent. on the average. Thoria mantles treated, for the sake of comparison, with thorium oxide, yttrium oxide, and erbium oxide showed no increase in the heat radiated. Consequently, the tests demonstrated that ceria and metals of the platinum group effected a relatively large increase in the proportion of the heat of the gas given out by radiation.

Attempts were made to determine the increase by direct measurements of the radiation. Very delicate thermometers with blackened bulbs were set up at a fixed distance from the incandescent burner. The results obtained showed an increase on the radiation from the simple thoria mantle of 14·05 per cent. for the ceria-coated mantle, and of 14·54 per cent. for the mantle coated with a metal of the platinum group. The oxides of erbium, yttrium, and thorium similarly applied to the thoria mantle caused no appreciable alteration in the radiation. The numbers obtained by this direct method are clearly of the same order of magnitude as those found indirectly with the calorimeter.

It is thus demonstrated, the author thinks, that ceria in the Welsbach mixture displays a specific power of increasing considerably the radiation of the mantle.

Gas v. Electricity for Motive Power.—In the current number of the "Builder," Mr. H. F. Hills, the Chemist to the Commercial Gas Company, has an article on "The Use of Gas in the Building Trades." In the course of it, he gives the following instance of the economy of gas compared with electricity when used for the production of motive power: "An attempt has been made during the present year, by Messrs. Hacker Bros., to utilize electric power at their saw-mill in Old Ford; but it has been found that the cost of power in this form is prohibitive. An electro-motor of about 20 brake horse power was supplied with current by the Poplar Borough Council, at an average price of a little under 2d. per unit; and the electricity bill for eleven weeks amounted to £54 9s. 5d. The electro-motor was then displaced by a Stockport gas-engine, of about double the power; and although the engine did a little more work per week than the electro-motor, the gas bill for twelve weeks amounted to only £20 5s. 5d. In this case, therefore, electricity as a source of power cost about three times as much as gas."

INVERTED GAS-BURNERS.

New Inverted Incandescent Gas Company's Specialities.

A large and choice collection of fittings is now to be seen at the show-rooms of the New Inverted Incandescent Gas-Lamp Company, Limited—all having been specially designed, with considerable taste, for their particular types of lamp. The Company's burner has been fully described in the "JOURNAL;" but in the time that has elapsed certain improvements have been effected. With the larger, or No. 1, pattern, the Company claim that they obtain an illuminating power of 65 candles for a consumption of 3 cubic feet of gas per hour. They have added to their burners one to which they have given the name of "Bijou"—and a suitable name it is, too, for it is both small and pretty. Some good effects indeed can be obtained with this burner for decorative purposes. Its consumption is only 1 cubic foot an hour, with an illuminating power of 20 candles. Both the No. 1 burner and the "Bijou" can be had with or without bye-passes. Adaptors for applying the burners to existing fittings are supplied; and bifurcated ones can be had for carrying two of the "Bijou" burners. For those gas managers who cannot inspect the fittings at the Company's show-rooms, the possession of their catalogue, which contains some beautifully prepared plates, may be found useful.

The "Star" Burner.

If in daily use the "Star" inverted incandescent gas-burner sustains the results that are attributed to it by the Company who are introducing it, then it will prove that simplicity of construction in such an arrangement is all that is desired. It is said that the burner is capable of giving an illuminating power of 70 candles with a consumption of only 2½ cubic feet of gas per hour. This is no less than 28 candles per cubic foot of gas, which, to say the least, ascribes to it a remarkably fine character. In fact, the result is so good that it suggests the question whether there has not been a mistake made, or that the burner has been tested by a generous observer. However, the point is one that buyers who are gas men can test photometrically for themselves.

As mentioned, the construction of the burner is extremely simple. The central part is a plain brass ½-inch tube of about 4½ inches in length, and of rather larger diameter at the head. All but the larger part of the tube is encased in one of steatite. Into the head of the tube, the gas-injector is screwed; and it is also screwed internally for connection with an adaptor for existing fittings. The method of supplying the air for combustion the Company claim as an exceptionally good one and as a novel feature. The three tubes running from the head of the burner perform the double duty of conveying air into the mixing-chamber just below the gas-injector and of supporting the coronet from which the globe depends—this being held in position by three thumb-screws. Over the inlet to one of the tubes is a movable cap for the adjustment of the air supply. It is stated that the constant passage of cold air through these tubes prevents them getting hot, and that the supply of air in this manner absolutely obviates lighting-back. We should have imagined that the tubes would, notwithstanding the rapid passage of air through them, become very hot, forming as they do part of the crown of the burner; and then the difficulty suggests itself as to where cold air is to be found in a room after the gas has been alight for a time. However, the main point is that the Company assert, and are prepared to guarantee, that there is no lighting-back; but whether they are correct in their idea as to how this particular merit is attained does not much matter.

Descending from an ornamental brass shield at the top of the steatite tube are three fixed supports carrying at the bottom a brass ring, slotted for forming a bayonet joint with the fire-clay ring of the mantle. In form, the mantle is similar to the type that has become well known in connection with inverted burners; but it is only 1 inch in length. This is sufficient; the flame from the burner being a very concentrated one. The Company have a large variety of globes of tasteful design, and suitable for all positions. It is pointed out, however, that the use of a globe is quite a matter of choice; the performance of the burner being as good without as with one. The burner, fitted complete, is supplied at low prices. As to its durability, nothing can be said in the absence of experience on our own part.

The Managership at Peterhead.—Out of seven applications for the vacant post of Manager of the Peterhead Corporation Gas-Works, the Town Council have selected the following as a short list: Mr. James Campbell, Assistant, Dunfermline; Mr. John Keillor, Assistant, Greenock; and Mr. Robert Young, Youghal. It has been decided not to request the attendance of the candidates.

LOSS OF LIGHT DUE TO GLOBES.

The loss of light due to various kinds of gas globes and chimneys, according to their degree of transparency, has been the subject of numerous experiments. The results given in the table below furnish additional information, which may be of interest. They relate to a series of trials made with a Nernst lamp, which was first placed, by way of comparison, in a thin frosted glass globe. The illuminating power was determined by a Weber photometer. An unenclosed mantle gave the light of 81·8 English candles; and the loss resulting from surrounding it with different materials is shown by the following figures:—

	Illuminating Power, Measured Horizontally.	Loss of Light per cent.
Globes—		
White "Holophane"	70·30	14·1
Prismatic glass	65·80	19·6
Rose "Holophane"	64·30	20·8
White opal	38·30	53·2
Yellow ,,	33·00	59·7
Ruby ,,	28·50	65·2
Rose ,, (grooved)	22·90	72·2
,, ,, (light)	19·90	75·6
Green ,, ,,	18·30	77·8
Coloured chimneys—		
Amber glass	71·30	12·8
White opal	51·80	36·7
Light blue	37·50	54·2

GAS-DRIVEN ELECTRIC LIGHT PLANT.

A recent number of "Engineering" contained an illustrated description of the electric light station at Tunis, to which special interest is attached from the fact that it is believed to be the first instance of a gas company adopting producer gas and gas-engines as the motive power for their electric light station.

The generating plant consists of three gas-producers, each capable of making gas for 150 brake horse power, and two small Hopwood boilers working at 85 lbs. pressure. Each of these boilers, which are fixed on a stage above the producers, is of sufficient capacity to supply steam for two generators. The producers are jacketed. A superheater consisting of two concentric pipes (the inner one arranged as a radiator) conducts the air and steam to the generator jacket, and thence to the grate. The gas made in the generator passes through the inner pipe of the superheater, and is conducted to a large surface condenser. A coke-scrubber, two chemical purifiers of large surface, and a gasholder, with wrought-iron tank of about 9000 cubic feet capacity, complete the gas plant. The piping is arranged in such a way that cleaning can be done at any point instantly by merely loosening a flange, without trouble or useless loss of time. A set of pressure-gauges fixed near the stokers' place show the pressure at the generator, the cooler, the coke-scrubber, the purifier, and the gasholder—thus enabling the man to control the working of the plant. A special calorimetric lantern also allows of the permanent control of the approximate calorific value of the gas.

The engine-room contains four high-speed Crossley gas-engines, each of 106 brake horse power, running four dynamos of 70 kilowatts each, at 240 volts. In front of the engines a wide trench has been provided for the piping. Two mains—16 inches in diameter for generator gas, and 10 inches in diameter for coal gas—pass along the engines, which can be worked by either of the gases. The engines can be changed from producer gas to lighting gas without having to be stopped. Indicator diagrams, taken respectively with coke gas and coal gas, showed for the former an output of 96, and for the latter one of 77 electrical horse power, at 96 and 64 explosions per minute; so that the power per explosion was 20 per cent. greater in the latter case. The producers are fed with ordinary gas coke from the works. It contains from 10 to 12 per cent. of ash and 4 per cent. of moisture. The consumption of coke does not exceed 3 lbs. per kilowatt.

The whole of the plant was supplied by Messrs. J. & O. G. Pierson, of Paris, who have for a long time urged that when owners of gas-works decide to build electric light stations, they should run them with gas-engines worked by producer gas.

We learn from the "American Gaslight Journal" that a Commission who have been engaged since December last in considering the question of a renewal of the franchise for the St. Paul (Min.) Gas Company, have reported adversely on the proposal to establish municipal lighting plant, and in favour of continuing the franchise for 25 years, in return for certain concessions made by the Company in regard to prices. The present rate of $1·30 per 1000 cubic feet is to be reduced to $1·15; and on the 1st of January of each year 5c. is to be taken off until $1 per 1000 cubic feet has been reached in 1907, after which the Municipal Authority are to have the power of fixing the price. The maximum charge for gas for lighting the streets and public buildings is to be $1 per 1000 cubic feet. The Company further agree to pay a tax of 5 per cent. on their gross earnings.

REGISTER OF PATENTS.

Hydraulic Centre-Valves for Gas-Purifiers.—Clapham, T. S. & S. B., of Keighley. No. 24,379; Nov. 7, 1902.

These hydraulic centre-valves are especially applicable for use in connection with a series of purifiers worked in any order; the ingress and egress of gas being regulated (so that the desired changes are made in the order in which the purifiers are brought into use) by the filling and emptying of cavities with liquids to form seals or lock the passages or empty and leave the passages open, as desired—the whole sequence of actions or alterations being carried out by the attendant regulating the inlet and outlet valves.

Fig. 1 shows the exterior of the apparatus with one set of the liquid or water valves mounted in position. Fig. 2 is a sectional plan upon which are shown the series of liquid or water valves in their positions as hereafter explained. Fig. 3 is a sectional elevation.

The apparatus is constructed so that surrounding the central gas inlet-pipe A are, firstly, an annular outlet space B, its outer walls being formed by tubular parts; secondly, a series of chambers C C^1 arranged around the inlet and outlet spaces, and formed by partitions reaching up to the tubular wall; and, thirdly, another series of chambers

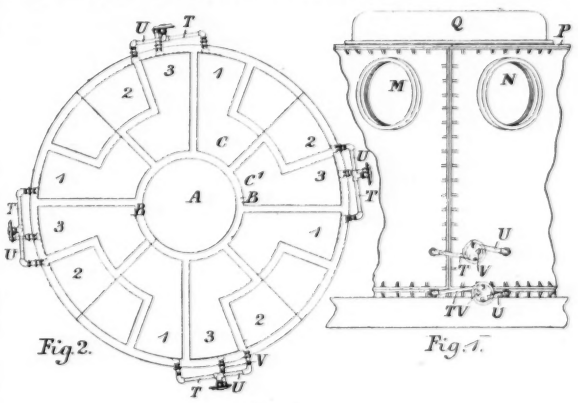
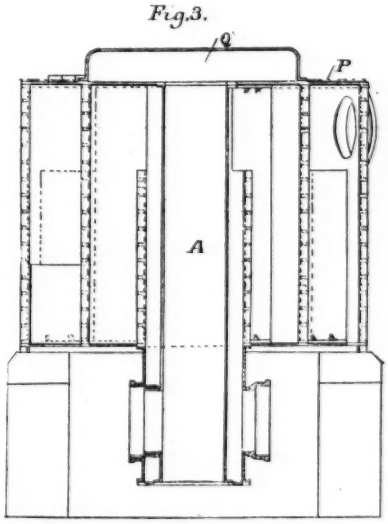


Fig.3.



arranged on the outside of the former, and formed by partitions reaching to the outer wall through which the egress and ingress openings M N conduct the gas from certain of the series of chambers, through appropriate mains that may be coupled thereto, to the purifying apparatus, from which it is brought back to certain of the other chambers, as hereafter explained.

The upper ends of all the chambers are covered by a plate P, which also covers the upper end of the space B; while the cover Q encloses a space into which the inlet-pipe leads to conduct thereto the inflowing gas. Leading from the space formed by the cover Q, openings are made through the plate P into the chambers C. Thus the gas flowing through the inlet-pipe A enters the space formed by the cover Q, from which it will flow into any of the chambers C which do not contain water. From these chambers C it passes through openings made in the partitions, and through the egress-openings M, to be conducted to any purifying apparatus as desired, on leaving which it is conducted back through the ingress-openings N.

It will thus be seen that, by regulating the flow of water into and out of the several series of chambers—leaving those through which the gas is desired to travel free of water while those through which it has not to pass are filled—the gas may be conducted through any one or any two or three consecutive purifiers, or through all or any number of purifiers that the apparatus may be constructed to control. The apparatus illustrated is made to regulate the flow of gas in connection with four purifiers; but it may be constructed to control or regulate its flow to a larger or smaller number of purifiers as desired.

By the arrangement of chambers described, it will be observed that they communicate with each other in pairs—thus necessitating the

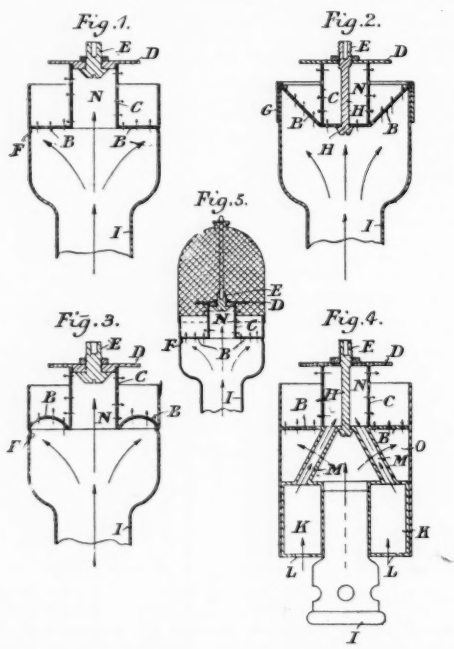
employment of three of such pairs of chambers (somewhat as shown by fig. 2, and marked 1, 2, 3) to carry out the desired method of controlling the flow of gas to effect the varied changes aimed at. Both the inlet and outlet valves are constructed to have three passages (1, 2, and 3) formed in the bed-plate; and since it is desirable to have the orifices of these passages in close proximity with each other, on the face of the plates it is necessary to form ducts so as to lead to positions at the back of same to afford space to put flanges around the ducts to secure the pipes T, U, and V thereto, as shown by fig. 2.

Incandescent Gas-Burners.—Sieverts, W. H. A., of Hamburg. No. 25,220; Nov. 17, 1902.

This incandescent gas-burner is said to give a great increase of illuminating power compared with burners of the class as hitherto constructed, consequent on it having within the burner-head a perforated ring from which rises vertically a central sleeve, the wall of which is also perforated, while the upper part of the sleeve is closed or covered by a special burner-disc, which latter may serve for the reception of the mantle-holder.

Figs. 1, 2, 3 show the upper portion of an incandescent gas-burner of the usual form, but provided with these improvements in vertical section. Fig. 4 represents the improvements applied to an incandescent gas-burner having means for preliminarily heating the air.

In the burner-head is arranged a perforated ring disc or sieve B. From this disc rises vertically a central perforated sleeve C, which is closed at its upper portion or covered by a burner disc D, thus forming a preliminary heating chamber N. This latter disc is provided with a socket or a screw E, for the reception of the mantle holder. The ring or disc B may be of various cross-sections. In fig 1 it is flat, in fig. 2 tapering off conically downwards, and in fig. 3 it is arched. The disc is supported upon a ridge F formed within the burner-head (figs. 1 and 3), or upon the upper edge of the burner-head (fig. 2). In the latter



case, a cap G is closely fitted over the burner-head, and serves to maintain the disc in place. The sleeve C is placed loosely upon the disc B, when this latter is of conical form, and is fixed between the disc B and the burner-disc D by a screw-bolt. The head of the bolt comes beneath the disc B, and it is screwed into the burner-disc D. Its upper extremity may form a hollow socket for the reception of the mantle holder.

The stream of air and gas ascending in the mixing-tube I divides into two streams before leaving the burner-head. One of the streams proceeds vertically through the openings in the ring or disc B, while the other enters the sleeve C. This latter stream is dammed up, so to speak, in the sleeve C, and is highly heated by the burner-disc D and the wall of the sleeve. By reason of this, it seeks to escape at a high velocity through the lateral openings in the sleeve C, upon leaving which it encounters the other current which is rising through the openings in the disc B with a less velocity. The united stream, therefore, ascends with an increased velocity.

Owing to the fact that a portion of the mixture of gas and air is heated in a special chamber in the burner-head, and is therefore caused to escape through the apertures in the chamber with increased velocity, the supply of the mixture of gas and air takes place at an increased velocity, and "consequently more oxygen is introduced into the mixing-tube I, and the good results obtained from these burners is attributable to this fact."

Fig. 4 shows a burner, the mixing-tube I of which is surrounded by a chamber or jacket K. This chamber is provided at its lower part with air-admission apertures L, and communicates, by means of tubes or passages M, with the preliminary heating chamber N, which is constituted by the disc B, the sleeve C, and the burner-disc D. In this form of the device, the mixture of gas and air ascending in the mixing-tube I enters the chambers O in the burner-head, and escapes from this latter through the fine openings of the disc B in a vertical direction. Atmospheric air passes through the openings L into the chamber K, and thence through the passages M into the preliminary heating chamber N, where it becomes highly heated. By reason of this heating, the air passes with increased velocity through the openings in the sleeve C, in the horizontal direction, encountering the vertically ascending stream, which is travelling at less velocity, and thus drawing it upwards with increased velocity.

Fig. 5 shows a burner similar to fig. 1, upon which a mantle is suspended in such a manner that its height is approximately equal to the diameter of the burner, and in any case does not exceed this by more than one-half. It has hitherto been usual—and is, indeed, necessary, the patentee remarks, in order to obtain the best results from burners as hitherto constructed—for the height of the mantle to be several times as great as the diameter of the burner. In this improved burner, however, a mantle of the ordinary length would result in a diminution of light. When the supply of gas is suitably adjusted, the flame of the burner is approximately hemispherical, and does not present a tongue or elongated point. A flame of hemispherical form is said to be far more economical than a tongue-shaped flame, and it is therefore advantageous with this burner to arrange the mantle in the manner described so as to produce or maintain this formation of the flame.

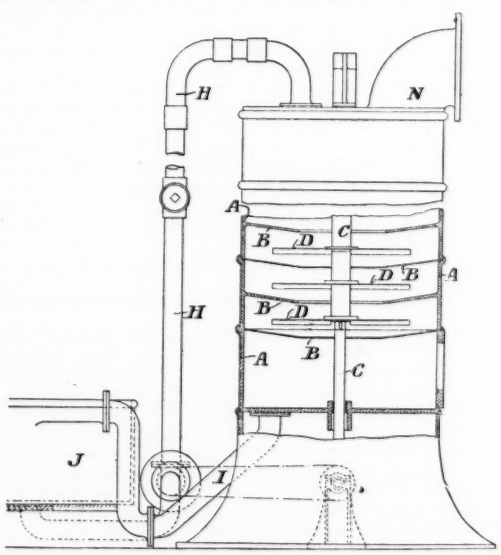
Burner for Incandescent Gas Lighting.—Bray, J. W., of Leeds; No. 15,630; July 15, 1903.

The upper portion of this burner-tube is made by preference cone-shaped, threaded internally towards the bottom in order to screw on to the lower burner-tube, which may be threaded for some little distance for this purpose on the outside, or the tube may fit on without being threaded. Directly below the threaded portion of the tube the diameter is increased so as to fit an ordinary globe holder, and threaded

for the reception of a gallery or an ordinary globe holder. The burner-tip may form part of the upper burner-tube; but it is preferred to make it separate, the tip being held in a metal socket. The burner is formed of a steatite, porcelain, or similar non-corrosive tip, and is provided with a wire gauze diaphragm immediately under, and in contact with, the tip, and also with another lower diaphragm of wire gauze, leaving a space between the two diaphragms, but by preference fixed on or near the shoulder of the tube. The combination of these three elements produces, it is said, a practically silent burner.

Washing Gas.—Schill, C. H., of Newton, near Hyde. No. 27,917; Dec. 18, 1902.

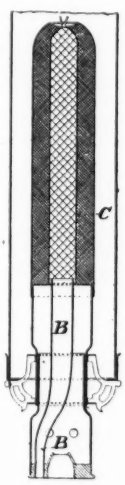
This apparatus for washing and similarly treating gas for the purpose of clearing it from tar, recovering ammonia, and other analogous purposes, consists of a vertical cylinder formed of a number



of rings or sections each consisting of a cast-iron ring A having an inwardly projecting plate or web B dished or declined towards a

central opening. The separate rings or sections are superposed and secured together so as to form a vertical cylinder of any desired height; and a shaft C runs down the central openings in the dished plates—supported in bearings top and bottom. On the shaft are fixed horizontally a series of circular plates or discs D, alternating with the dished plates B. These discs terminate at a suitable distance from the interior wall of the cylinder, so as to leave an annular space round each disc, which preferably has on its lower side a number of radial or other ribs or projections.

The gas enters the bottom of the cylinder, and takes a zig-zag course upwards—being guided alternately by the cylinder plates B inward to their central openings, and by the shaft discs D outward to the annular spaces between them and the cylinder shell. Meanwhile, the shaft is being rotated by any convenient driving gear. The water or other liquid is introduced through a pipe H at the top of the cylinder on to the top dished plate, and passing through its central opening flows on to the rapidly rotating shaft-disc, by which it is thrown by centrifugal force outward against the shell of the cylinder, being thereby sprayed, and passing downward through the next dished plate reaches the next rotating shaft-disc, and so on. The ascending gas meeting the descending liquid has extracted from it the ammonia or other elements it is desired to recover. The liquid finally reaches the bottom of the cylinder, whence it is led through a valve or luted pipe I into a tank J, from which it may be pumped back to the top of the cylinder to be used over again.



Incandescent Gas-Burners.—Clarke, M. A., of Southampton. No. 17,699; Aug. 15, 1903.

The patentee proposes to arrange for the supply of a central current of air by natural draught through the entire length of the mantle, by means of a tube B and continuous shaft C. By this means, it is said that "practically perfect combustion and a much denser light is obtained, the constant supply of air feeding the flame securing these results; further, the flame of mantle being formed, by the central air-shaft, into a tubular shape, it rises to a greater height, and allows of a much longer mantle being used." The tube B is fixed at the bottom of the burner, and is carried up slightly above the top; and the air-shaft C is screwed on the projecting part of the tube, and thus held in position. The air-shaft C is made of perforated metal, or fine wire gauze, of any suitable mesh and material. The mesh may be of uniform size or vary in size—gradually larger towards the top.

Purification of Naphthalene and Anthracene.—Catchpole, F. E. & E. A., of New Cross, S.E. No. 16,641; July 29, 1903.

This invention consists in exposing either naphthalene or anthracene, when in the crude condition, to a process of "sweating" by the application of dry heat thereto, so that the oleaginous matter or creosote contained therein may be liquified and drained therefrom. Hitherto the usual and best known way of attaining the same ends has been by means of the process known as "hot pressing." But—to dispense with this costly process, and thereby commercially cheapen both the purified naphthalene or anthracene and the oil or creosote extracted therefrom—the patentees propose to place the block, slab, or other form of naphthalene mass into any suitable chamber to which heat may be applied in dry form (either by a jacketed arrangement, or by pipes or conduits passing therethrough or therearound or both); while the heat used may be derived from any available source, which may conveniently be that of live or exhaust steam or other means.

The block of naphthalene is mounted in the chamber on a staging or platform of grid-like or channelled formation, constructed of wire-netting, perforated metal, channelled or perforated concrete, bricks, or tiles, or other materials; while means may be provided by which the oil or creosote, as drained therefrom, may be led by suitable conduits from the chamber to where required. The naphthalene block having been placed in position upon its staging or platform, the chamber would then be closed, and the source of heat opened, and the heat applied thereto. For preference, the patentees at first employ a low temperature, gradually rising until a temperature is reached suitable for liquifying the oil or creosote, and draining this from the naphthalene. In practice, they find the most suitable temperature to be 70° C. or thereabouts; the character or quality of the resultant naphthalene depending to some extent upon the duration of this operation and the temperature employed. It is, however, easily possible, by suitably regulating these conditions, to obtain, in the case of naphthalene, a material melting at 79° C.

With naphthalene purified by this process, the ordinary well-known operation of chemical washing may be omitted, if only a second-grade quality of naphthalene is required. For a purer quality, the quantity of chemical materials used in washing may be considerably reduced, as compared with the quantities of chemicals employed in combination with the present expensive process of hot pressing. Thus the invention, it is claimed, effects a great saving in this direction also. It is likewise found that the subsequent distillation may be carried on until the still be as near as possible empty, as a uniform product distils over to the finish absolutely.

This system for purifying nahpthalene may also be employed in the purification of anthracene; the only difference in the process being the employment of a higher maximum temperature (about 200° C. being found sufficient), which may be derived from superheated steam or other suitable means.

MISCELLANEOUS NEWS.

GLASGOW CORPORATION GAS SUPPLY.

The Price of Gas—The Accounts for the Past Year.

A Special Meeting of the Glasgow Town Council—Bailie D. M. Stevenson presiding—was held on Monday of last week, to consider the report of the Gas Committee and the accounts of the department for the year ending May 31, which had been sent back by the Council to the Committee. The report came up amended to the extent (as stated in our "Scotch Notes" last week) of stating that there was a surplus on the year's working of £48,104, and that out of this sum the Committee had met the balance at the debit of the account for the previous year, amounting to £15,085, and had carried forward £33,019 to the credit of the current year's account. Then with regard to the price of gas, the report, as amended, read: "The Committee feel that they are justified in recommending that the price of gas for (1) lighting purposes should be 2s. 1d. per 1000 cubic feet, a reduction of 3d. per 1000 cubic feet; (2) motive-power purposes, 2s. per 1000 cubic feet, being the same rate as charged last year; (3) within the additional area of the gas supply the charge for gas for (*a*) lighting purposes should be 3s. 1d. per 1000 cubic feet, a reduction of 3d. per 1000 cubic feet, and for (*b*) motive-power purposes 3s. per 1000 cubic feet, being the same rate as charged last year.

Mr. J. Willock, the Sub-Convener, in the absence of Mr. R. M. Mitchell, the Convener, moved the approval of the report; and Bailie Finlay seconded.

Mr. Boyd moved, and Mr. O'Hare seconded, that there be no difference in the price of gas.

The Chairman said that it was a pity that the mover of the motion did not explain the proposal. The Committee were divided on the subject. One minority united with another minority, forming a majority, who recommended as in the report. This was on the understanding that the whole subject of differential rates be discussed next year.

Bailie Finlay explained that he did not wish to shirk the matter; but he thought that the opponents of differential rates would fall into line, on the distinct understanding that the subject was to be left over for a year.

Mr. Forsyth said the Council had already agreed to produce gas of less illuminating power than had been sold hitherto; and, as this would have an important effect on the price, he wished to know whether the Committee had agreed to shortly produce cheaper gas.

Mr. Willock explained that they had power to reduce the illuminating power of the gas to 16 candles, which undoubtedly could be produced cheaper. This was a question which would come before them when they got a new Manager. In the report which they first presented, they treated the deficit in the Electricity Department, amounting to £13,895, as if it were a bad debt. This time they would find that it was carried to a suspense account, thereby carrying forward the sum. It required £23,000 or £24,000 to give 1d. reduction. They had, however, money to go upon, as it was stated in their first report that £19,124 had been applied to the conversion of gas annuities. This they had carried over as a balance, and with the £13,895, it made £33,020. With this, they made a reduction of 1d. per 1000 cubic feet in the price of the gas, over and above the reduction of 2d. which the Committee originally recommended. The Committee were in this position, that last year their efficient Gas Manager—there was none more so—recommended a differential rate of 4d. They then stated, in good faith, to the public that, while it was only a trial, they might go further than they had done. They had not had much to go upon, for the trial had not been long enough to give them any experience in the matter. But they thought it would be very hard, seeing it was stated in good faith last year, if they were to do away with the difference. It would mean a rise to those people to whom the rate last year was 2s. While other people were getting a reduction of 3d., they would be raised 1d. So the Committee, by a majority, decided that the rate for power purposes should be 2s.—the same as last year. The reduction meant a sum of about £70,000—equal to 3d. upon the rates, though it had nothing to do with rating. A penny per pound on the rates brought in about £20,000, and a penny per 1000 feet of gas was about the same. They were, therefore, giving a benefit to the extent he had stated to the consumers of gas in the city.

The report was then adopted, only three supporting the amendment Mr. Boyd dissented.

Mr. Willock moved the approval of the accounts, and Bailie Finlay seconded.

Bailie Burrell said that when the Corporation took over the gas undertaking in 1869, a dead loss of £386,000 was incurred by their granting annuities instead of borrowing and paying in cash. How did the liability of £1,158,000 come into the accounts? Till this year it was put as a total liability of only £415,000. Some of the annuity holders had now converted into 3 per cent. stock; and therefore the Committee were obliged, for the first time, to state the liability. But they had only stated it to the extent of one-fourth. The accounts, as they stood, were inaccurate and misleading. The amount of their liabilities should be frankly and fully stated, so that members might see how they stood.

Mr. J. Macfarlane said he would like to call the attention of the Committee to the gas-stove department. It was instituted about eighteen years ago, after considerable and serious opposition. They considered, at that time, that they ought to encourage the sale of gas during the day, and so they started the department. They made up their mind, however, that they would not have a manufactory, and that, as far as possible, the lending out of stoves should be limited at first, to see if traders would take up the business. But now he found that the department was larger than ever; and it seemed to him that it was not doing much good. They had in the accounts expenses chargeable to repairs of stoves £7159, and hires £6771. Between

these two items there was a difference of £388. If they added to this the amount written off for depreciation, they would find the loss for last year to be almost £5000. Of course, there would be more gas sold, to the amount of about £26,000, upon which there would be a profit. He would suggest that, as far as possible, the Committee should leave the supply of stoves alone, and allow traders to push them.

Bailie FERGUSON said they were going on paying interest for ever and ever. Generations yet unborn would have to pay the debts they were incurring. Was there no possibility, when money was cheap, of paying off the whole of their obligations?

The CHAIRMAN said that the speech which Bailie Burrell had made was the speech which he made five or six years ago. The Council had recently obtained parliamentary powers, and were now converting the debt as Bailie Ferguson suggested.

Bailie P. G. STEWART thought the gas-stove department had been a great benefit to Glasgow; and he hoped that they would carry it very much farther.

Mr. W. F. ANDERSON did not think, with all due respect to Bailie Stewart, that it was good business that they should spend £7000 on repairing gas-stoves, the gross return from which, in cash, was only £6000. Now the Gas Committee had shown the way in the matter, they should let the business alone. He thought they had a right to complain of the very heavy depreciation they were writing off gas-stoves. It was not fair that they should be practically writing off £5000, and that they should be charging people to-day a high price for gas, in order that they might, five or ten years hence, supply it at a very much cheaper rate. They ought to depreciate properly, not to the enormous extent they were doing.

Mr. A. MURRAY said he had been looking into the subject of the depreciation of the gas plant. He had always been met in Committee by the statement that so much had been written off in past years that there was no need to write off any further considerable sum of money. This argument cut two ways. He did not know whether, as a matter of fact, too much was written off in previous years; but he knew that the rate of depreciation was stated to have been 2½ per cent. on works and plant and pipes, 6 per cent. on meters, and 10 per cent. on stoves. If these percentages were too large, then they of the present day were getting the benefit of them, and were getting gas at the expense of those who paid these large depreciations. But he was not sure that the depreciation had been too large. The extraordinary method adopted by the Gas Committee led to a very curious and unexpected result. The 2½ per cent., when they looked into it carefully, was only 1½ per cent. on the cost. The depreciation written off year by year, was not, as in the tramways and some of the other departments, on the cost, but on the amount that was left after a succession of large sums had been applied in the way of depreciation. The result was that, instead of 10 per cent. upon stoves, it was 6 per cent.; and upon meters, instead of 6 per cent., it was only about 4 per cent. He had analyzed the depreciation for a series of years; and he was quite sure the Council would be surprised to know what, very simply, was the rate of depreciation they had been writing off. During the last three years, the amount was, on an average, £1 6s. 2d. per cent.; while in the previous five years—1896-1900—they wrote off just 2 per cent. per annum. This was not a very heavy depreciation; and it included the 10 per cent. upon stoves, and so on. In the years 1881-85, when gas was at 3s. 8d. down to 3s. 6d. per 1000 cubic feet, their predecessors—who were, perhaps, not the very best financiers, but were very shrewd and cautious, and had good business sense to guide them—in good years made very large provision for depreciation; and what they wrote off amounted to £5 2s. per cent. They were getting the benefit of that to-day. They ought to write off depreciation on the whole of their debts, and allow those who were to come after them to get cheap gas. Half-a-million of money had already been spent on the Provan works. Was the revenue likely to increase so as to provide depreciation upon this? He certainly should have supported the view that the original accounts should have been approved of, and the £19,000 written off.

The CHAIRMAN was sorry that these remarks about depreciation had been made. They were grossly unfair.

Mr. WILLOCK said that, with regard to depreciation, Mr. Murray had answered himself very well by showing that in previous years their forefathers had written off sufficient depreciation to meet, to a considerable extent at any rate, what was required. The accounts showed that in 1894-95 depreciation written off was £67,518; in 1896-97, it was £33,642; and for last year, it was £50,037. They would find, in reference to the works at Old Kilpatrick, that they had wiped them off entirely by allowing £3067, leaving only the value of the ground. At Pollokshaws, they had done the same. Unless for the value of the ground, the whole works were now wiped out. At Milngavie, it was the same. All this had been done in one year. He thought that, on the whole, the depreciation was sufficient. Last year he went to the trouble of ascertaining the valuation of all the leading gas-works in the kingdom; and he found that the average was about £4 10s. per ton of coal carbonized; while in Glasgow, with £500,000 upon new works yet unproductive, it came to only £2 15s. So far, therefore, as capital was concerned, they had the lowest capital for the quantity of coal carbonized of any large gas-works in the kingdom.

The accounts were then agreed to.

THE ACCOUNTS.

The accounts for the year show the amount of the stock capital to be now £280,038. Hitherto the amount stated has been the £415,000 of stock capital which was taken over in 1869, upon which annuities were payable to the extent of £34,762. During the past year, the conversion scheme came into operation, under which £97,033 of stock has been cancelled by the issue of £269,493 of Corporation 3 per cent. stock, redeemable in 1921; and the sinking fund, to the amount of £104,816, has been applied in redeeming £37,928 of original stock. By these means, the annuities are reduced to £23,496; but interest to the amount of £8134 has to be paid upon the Corporation stock, which makes the annual saving to the Corporation by the conversion and redemption £3132. The loan capital authorized is £3,200,000, of which there has been borrowed £2,627,000, leaving £573,000 to be borrowed. But the Gas Committee have borrowed £1,087,000 for the Electricity Department, of which they have repaid £49,603, leaving their indebtedness on that account at £1,037,307. For the Gas Department proper, the total sum borrowed has amounted to £1,540,000. Of this total, they have redeemed £301,810, leaving their indebtedness upon the gas undertaking at £1,248,190, or, with the annuity and Corporation redeemable stock, at £1,797,721. The increase in the capital account during the year has been £225,125 in the Gas Department, and £57,076 in the Electricity Department. The capital expenditure during the year amounted to £298,285, of which £205,787 was in connection with the new Provan works, and £2579 upon the purchase of the Milngavie Gas Company's undertaking. The revenue account shows a total income of £885,414—an increase of £4106 upon the previous year. Of this, £653,903 was derived from the sale of gas (a decrease of £35,513, due to the reduction in the price a year ago), £64,705 from the sale of coke (an increase of £4530), £159,516 from ammoniacal liquor and tar (an increase of £50,066), and stove hires amounted to £6771 (an increase of £234). On the expenditure side, coal cost £398,639 (a decrease of £37,181), purifying materials, and oil, water, and sundries £32,070 (an increase of £90), salaries of engineers, superintendents, and officers at works £4664 (an increase of £112), wages at works £89,231 (an increase of £1958), repairs and maintenance of works and plant £54,061 (an increase of £2437), and carting and stabling account £7602 (an increase of £204). The total cost of gas manufacture was £586,268, or a decrease of £32,378. Distribution cost £66,141, or an increase of £5865. The charge for repairs of gas-stoves amounted to £7160, or an increase of £1574. The total ordinary expenditure amounted to £684,065, or a decrease of £39,384. But there was added for depreciation £50,037, which raised the total expenditure to £734,102, or a decrease of £21,389. The balance carried to profit and loss account was £151,311, an increase of £25,494. After meeting all charges and transferring £17,198 to sinking fund, there remained a surplus of £48,104.

The quantity of gas manufactured was 6,431,878,050 cubic feet, or an increase of 67,810,250 feet, equal to 1·05 per cent. Compared with two years ago, the increased make amounted to 310,511,550 feet. The quantity of gas sold or accounted for amounted to 5,708,143,225 feet, or an increase of 19,853,184 feet. There was unaccounted for 723,734,825 feet, equal to 11·25 per cent., as compared with 10·62 per cent. in the year 1901-02, and 10·55 per cent. in 1900-01.

LONDON COUNTY COUNCIL AND GAS SUPPLY.

The *agenda* for the Meeting of the London County Council to-day contains a long report by the Parliamentary Committee on their proceedings in connection with the legislation of the past session. Eight Private and four Public Bills were promoted, and five of the former failed to become law. One of these was the Gaslight and Coke Company's Acts Amendment Bill. But the Committee say their efforts in regard to it were by no means fruitless, inasmuch as the Bill "formed an important factor in negotiations with the Company, which resulted in considerable amendments being made in their Bill in the direction of the proposals in the Council's Bill." The Committee had before them 48 Private and 40 Public Bills, exclusive of their own; those relating to tramway undertakings and gas supply calling for the most serious consideration. The Committee inform the Council that in several of the Gas Bills questions of testing were involved, and communications took place with the Board of Trade on the matter, with the result that the Board had promised to appoint a Departmental Committee to consider the question. The Committee then proceed to show in detail the results arrived at in regard to the various Bills; their remarks on those relating to gas being as follows.

Gaslight and Coke Company's Acts Amendment Bill.—This Bill, which was the direct outcome of the conference of Local Authorities representing districts in the Company's area north of the Thames, held at the County Hall on March 7, 1902, contained proposals for a reduction in the Company's existing standard price from 3s. 9d. per 1000 cubic feet to 3s. 3d., coupled with a scale of increase or decrease of dividend equivalent to the secondary scale recommended by Sir James Rankin's Committee of 1899; for a reduction in the standard of illuminating power of gas supplied by the Company from 16 to 14 candle power, together with a reduction of 2d. in the standard price, which would thus have become 3s. 1d.; and for one-half of the Company's clear profits (if any) after paying a dividend of 4 per cent. per annum to be carried to a fund to be applied to the redemption of obsolete capital. The Company also promoted a Bill dealing with questions somewhat similar to those contained in the Council's Bill; and, by arrangement, both Bills were read a second time in the House of Commons without discussion—the consideration of the whole case thus being left to the Select Committee. Before the Bills reached the Committee, however, negotiations were entered into with the Company, and an agreement was arrived at as the result of which amendments were secured in the Company's Bill in the direction of proposals in the Council's Bill, and the latter was withdrawn.

Commercial Gas Bill.—Petition presented in the House of Commons. In view of the decision of the Board of Trade to appoint a Departmental Committee to deal with the question of gas testing, it was arranged with the promoters that the Bill should be allowed to proceed as a temporary measure limited to three years only, and that in the meantime the Committee would consider the whole question. Bill passed.

Crystal Palace District Gas Bill.—Petitions presented in both Houses. The Council were successful on all points with regard to illuminating power, standard price, and testing; and the Bill was withdrawn before the third reading in the House of Lords.

Gaslight and Coke Company Bill.—Petition presented in the House of Commons. An agreement was arrived at with the Company, as the result of which amendments were secured in the Bill in the direction of proposals in the Council's Bill on the same subject; and the latter was then withdrawn. Bill passed.

PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

Portions of the Evidence Abstracted.

Fifth Day—July 6.

Mr. J. H. TRITTON, Deputy-Chairman of the Central Association of Bankers.

Evidence as to corporation borrowing was given by Mr. J. H. Tritton, the President of the Institute of Bankers and Deputy-Chairman of the Central Association of Bankers, who said that the rapid growth of municipal indebtedness had been a subject of concern to the latter body (on whose behalf he appeared before the Committee) for some time past—mainly from the national point of view. Within reason, advances by banks to local authorities were really necessary; but there should be clearly defined methods for securing the bankers against loss. Bankers considered they had the right to set off, one against the other, the various accounts of a corporation; but they wished to have this regularized. That was to say, they would like it made absolutely clear that, where one account was in funds and another was overdrawn, they could set off the one against the other. He was aware of one case in which a bank had lost its money owing to an advance made by it. It arose under section 210 of the Public Health Act, 1875, with the Southampton Corporation, who proposed to levy a general district rate, and to include in the expenses to be paid out of the money raised by the rate part of the amount of an overdraft by the Corporation on their bankers, which had been incurred more than six months before the making of the rate. The Court held the rate to be invalid, on the ground that it was made in contravention of the Act; and it followed that the Corporation had no power to repay the overdraft. In view of the fact that the stock of all corporations with a population of more than 50,000 were now trustee stocks, he thought that a greater strictness and a greater sense of responsibility should be shown in the expenditure of these bodies. He was in favour of a uniform system of auditing and account keeping.

Mr. HAWARD.

Mr. H. E. Haward, the Comptroller of the London County Council, who was shortly examined at the previous sitting of the Committee (*ante*, p. 56), gave evidence at length with regard to the various undertakings of the Council. Attention was mainly directed to the housing schemes; but turning to the question of accounts, witness said that he personally attached very great importance to an independent audit, and thought it was obvious that an auditor appointed by a Government Department occupied a more independent position than one selected by a body whose accounts he had to audit. He also placed importance upon the possession by the auditor of the power to surcharge or disallow, although he thought that it was a question whether the auditor should exercise these functions directly or whether they should be exercised by a Government Department upon his report. He himself inclined to the latter view. It was also very important that the auditors should possess a thorough accountancy training. It was said, and with some truth, that the auditors of the Local Government Board, or some of them, gave more attention to the legal bearings of the expenditure than to accountancy methods. There should be, as far as possible, uniformity of accounts; and a Government Department should prescribe the form to be used by local authorities in a general way—there being an opportunity for varying them according to local needs and conditions. From the point of view of making comparisons between the operations of one municipal body and another, it seemed to him to be very important that there should be, as far as possible, uniformity in the style of accounts adopted. An auditor appointed by municipal councils with the sanction of a Government Department would be a step in the right direction; but he would prefer that he should be appointed quite independently.

Mr. ALEXANDER MURRAY, J.P., of Glasgow.

The next witness was Mr. Alexander Murray, a member of the firm of Messrs. Carswell, Murray, and Lauder, chartered accountants, and a town councillor of Glasgow. He said that he had held the honorary office of City Treasurer, and had therefore given close attention to local financial affairs. The Corporation, in addition to the ordinary work of a great municipality, were the owners of gas, water, and electricity works, tramways, telephones, and markets, and also of some smaller undertakings. The acquisition of these concerns had been gradual; and they had been taken over, not with the object of making profits, but rather to provide what was necessary for the proper and efficient equipment of the city in view of modern requirements. The first undertaking acquired by the Corporation was the water-works. All the concerns were managed on strictly commercial lines; and the books and accounts were kept quite as well as though they were the property of a limited company. The principle acted upon was that the departments should be self-supporting as far as possible; and they objected to one concern subsidizing another. They had never had to call on the rates for any charge in support of any one of the undertakings; and, as far as could be seen, there was no likelihood of such a demand becoming necessary in the future. With regard to the profits, these had almost invariably been used in improving the service and reducing the charges to the consumers or users; the principle had been, not that the rates should gain, but that the customers should get the benefit. The accounts were audited by independent professional accountants appointed by the Corporation; and the work was completed within a few weeks of the close of the financial year.

Witness explained that during the last ten years Glasgow had spent on new works the sum of £9,470,000; and at the close of the financial year 1902 the city debt was £13,034,000. Ten years previous the total was £6,715,000; and if the Corporation had not been paying off debt during this period, the amount standing on the books as borrowed, and on which interest would have been paid, would now have been about £17,000,000, instead of £13,000,000. With regard to the sinking fund, this was, as explained by Mr. Kay, invested in new undertakings; but in order to do this, they first had to secure parliamentary powers for the borrowing. In applying the sinking fund in satisfaction *pro tanto* of the borrowing powers, they cancelled the borrowing powers to the same extent. He did not think, however, that the existence of a considerable sum coming in from the sinking fund would induce the Corporation to apply for fresh borrowing powers when otherwise they might not have done so. At all events, it would be necessary to satisfy Parliament that the money required was for a specific and a reasonable purpose. If they did not get the money from the sinking fund, they would have to obtain it from some other source. If whenever they and other corporations had sums to the credit of sinking fund to invest they had to go into the market and buy high-class stocks, it would be easily imagined what a serious state of affairs might arise when they came to realize. The Glasgow Corporation were paying off in sinking fund at the rate of over £250,000 a year. With regard to what Mr. Kay considered to be the undue addition to the amount of their assets [see "JOURNAL" for the 22nd ult., p. 760], the Corporation could not understand why there should be any serious objection to the accumulation of the sinking fund. Mr. Kay seemed to say that by their method of dealing with the fund they were unduly accumulating a surplus; but they wished to err on the safe side. Some members of the Council had always desired to lay aside liberal sinking funds and to make full provision for depreciation. Both operations, of course, went to increase the surplus assets; and they thought that, as prudent financiers, this was a wise course to follow, and not to run upon such very narrow lines as would leave no margin for contingencies and risks which might arise in the future. Of course, a great deal depended upon the value of the assets, which might be the subject of dispute; and this was a matter for expert opinion. There was therefore all the more need to have the sinking fund well looked after, and depreciation written off. In Glasgow, they tried as far as possible to maintain each undertaking out of revenue. Ordinary maintenance should always be practicable; but it might sometimes not be possible to provide for depreciation in the early years of undertakings such as the electricity works, where there was a large amount of capital sunk in plant which was only partially yielding a revenue. But after the concern was in full operation, depreciation ought to be provided. The sinking fund was supposed in theory to be fixed according to the life of the subject; so that when the sinking fund was at an end, the undertaking might be assumed to be at an end also. They did not, however, in Glasgow, proceed upon this assumption; for they thought that the sinking fund had no necessary connection whatever with the life of the subject. If the subject was maintained, or where maintenance was not possible a depreciation fund was provided, the sinking fund need have no reference at all to the life of the subject. It did not seem to them that it would be good finance to exhaust the subject at the moment that the sinking fund was complete, and then to have to borrow again in order to renew it. They preferred to pay back the debt and maintain the subject, and hand over at the end of the sinking fund period a plant fully equipped and fit for use.

Questioned by Mr. Platt-Higgins, witness said that, in a paper he read before the Glasgow Philosophical Society, he contended that there could be no profit until depreciation had been written off, and that in the case of a municipal undertaking profit was not shown until a year's instalment of debt or sinking fund was also set aside. He would be very pleased to see effect given to this view throughout the length and breadth of the land, and every corporation required to conform to it. In the case of many of the smaller municipalities, however, he did not think it was practicable. Then, of course, what he had said was subject to the reasonable modification already mentioned in the case of new undertakings, where a large amount of plant was put down which had not begun to earn a revenue. Here a suspension or modification of the sinking fund ought to be allowed until the capital was fully in a position to earn revenue. It was a fact that during the last ten years the rates of Glasgow had increased by about 33 per cent.

Mr. JAMES DALRYMPLE, Accountant to the Glasgow Corporation Tramways Department.

Evidence at considerable length was given, as to the system on which the finances of the Glasgow Corporation Tramways Department are managed, by Mr. James Dalrymple, who said that the principle they worked on was that when, at the end of the sinking fund period, the loan was absolutely paid off, there should be a complete tramway in perfect order to hand over to posterity. Asked by Mr. Powell-Williams how he met the objection that there would be no burden in the way of capital charge on the ratepayers thirty years hence (about the time for which the loan was granted), and that therefore there was no obligation on them to hand the tramways over as a going concern, witness said they considered the ratepayers of that day would have their own burdens to bear, and that if the present generation obtained power from Parliament to borrow, the loan should be absolutely paid off at the end of the borrowing period, and the subject should be standing in its original perfect condition. Mr. Powell-Williams: "But you are putting two burdens upon the ratepayers of this generation—one the burden of the supply of sinking fund, and the other the burden, whatever it may be, involved in making a free present of tramways to the next generation. Why should you do both?" Witness: "We have incurred the debt; and I think we are obliged to pay off the debt, and we are also obliged to maintain the subject perfectly as against wear and tear as well as against renewal." Mr. Powell-Williams: "I put it to you that it might be objected, and probably will be on behalf of some corporations, that there is no necessity to build up a sinking fund which extinguishes the debt, and also make a present of a fully equipped undertaking to the next generation?" Witness: "I lay more stress on the provision for depreciation than on the redemption of the debt. I think that Parliament should lay it down as a rule that in municipal undertakings a depreciation fund should be provided; and the repaying of the debt might be extended to forty or fifty, or even sixty, years, if the undertaking was being kept up in its original perfect condition." Witness went on to explain that the ratepayers of to-day were somewhat overburdened by having to provide sinking fund on a short loan, and also depreciation. The best way to remedy this was to spread the sinking

fund over a greater number of years. He agreed with the view that in the case of a town hall, for instance, which would last for a hundred years, the loan should extend over this period, so that each generation should pay its proper share of user for the building.

Mr. WILLIAM BATESON, Borough Treasurer of Blackpool.

The Blackpool Corporation own the gas-works, electric light works, tramways, and various other undertakings; and in partnership with neighbouring Local Authorities, they are also the owners of the water-works. During the past six years the Corporation have employed professional accountants to audit the accounts, in addition to an examination by Elective Auditors, and the Mayor's Auditor under the powers of the Municipal Corporations Act. Mr. William Bateson, the Borough Treasurer, explained how the accounts are kept, and said that for trading undertakings it would be desirable to have a uniform system. He thought the offices of Elective Auditor and Mayor's Auditor ought to be absolutely abolished, and that in lieu of the audit provisions of the Municipal Corporations Act and the Public Health Act, the audit should be conducted by professional accountants appointed by the Town Council. The audits should be continuous, in order to be of the greatest possible benefit to the municipality. He would not give auditors direct power of surcharge, but would allow them, in case they thought any money had been wrongly expended, to make a report to that effect, so that the ratepayers might take action in a Court of Law. With regard to the evidence of Mr. Floyd [*ante*, p. 54], that it was not the practice of the professional auditors in Birmingham to ascertain whether the expenditure of the Corporation had been correctly allocated between revenue and capital, witness said this had not been his experience. Last year the professional Auditor at Blackpool brought him a long list of items debited to capital account; and he (witness) had to convince him thoroughly that every single item ought to be so charged. The Auditor even went so far as to attend at the gas-works and the electric light works, not only to see the wages-books of the workmen, but to go behind these and inspect the actual daily time-sheets, in order to ascertain whether the work on which the men had been employed had been properly charged to capital instead of revenue. He knew it was the practice in a large number of boroughs in Lancashire for the professional auditors to make a very strong point with reference to the allocation of capital and revenue expenditure. The total amount of the loan debt of the Blackpool Corporation was £1,560,000 in round figures; and it had been accumulating since 1865. They had had no fewer than 400 separate loans, which was one for every 125 people who lived in the place. This, however, was not a fair way of looking at it, for the large floating population should be considered. Part of the indebtedness of Blackpool was owing to the visitors—the same as at other watering places. He thought it desirable that, as far as possible, all perishable things, or at all events those which had a short life, should be provided out of revenue.

Mr. Platt-Higgins remarked that in the case of the Blackpool electric lighting revenue account and the tramways revenue account, no allocation whatever seemed to be made for depreciation, but only for interest and sinking fund. Witness replied that, assuming the period granted by the sanctioning authority was based on the estimated life of the subject for which the loan was given, the sinking fund provision was, in his opinion, quite sufficient to supply all necessary depreciation. He did not admit that no allowance for depreciation was made in the accounts mentioned; he said they did make allowance for it under the head of sinking fund. He absolutely differed from Mr. Murray in his contention that there should be provision for depreciation as well as sinking fund. It would, however, be very advisable that the matter should be thrashed out—especially if the form of accounts for municipalities was to be standardized. The question of depreciation was not a new one with the Treasurers' Institute, of which he was Vice-President. It had been under their consideration, especially in connection with electrical undertakings, for the past two years; and the Executive Council last year met a deputation upon the matter from the Council of the Municipal Electrical Association, and tried to come to an understanding. The Electrical Association held a meeting in London in February, 1902, when representatives were present from many of the corporations owning electrical undertakings. The resolution then passed as to the provision for depreciation was submitted to the Treasurers' Institute, who absolutely agreed with it. The resolution ran as follows: "That in the opinion of this Association electricity supply undertakings having to be maintained in a full state of efficiency out of revenue, no depreciation or further writing off of capital is necessary when the period allowed for repayment of loan is not greater than thirty years, as the equated life of the works exceeds this period."

MR. CHAMBERLAIN AND THE BIRMINGHAM GAS AND WATER WORKS.

In view of the prominence into which the late Colonial Secretary (the Right Hon. Joseph Chamberlain, M.P.) has come during the past few weeks, in connection with his fiscal scheme, the following particulars in regard to his connection with the acquisition of the gas and water undertakings by the Birmingham Corporation nearly thirty years ago will probably be perused with interest by some of our younger readers. They are taken from a sketch of Mr. Chamberlain's career which appeared in the "Birmingham Daily Post" last Wednesday.

"The great work of Mr. Chamberlain's first year as Mayor was the acquisition of the gas undertaking, up to that time carried on by two rival Companies—the Birmingham Gas Company and the Birmingham and Staffordshire Gas Company; the latter possessing an area of supply which included West Bromwich, Walsall, Smethwick, and Tipton. The object with which the gas undertaking was acquired was confessedly to provide increased revenue for the borough in aid of much-needed sanitary work. A resolution authorizing the General Purposes Committee to negotiate terms for the purchase of the gas-works was submitted by Mr. Chamberlain to the Council in January, 1874, with so much persuasiveness that it was carried with only two dissentients. Mr. Chamberlain had previously, upon his election as Mayor, privately and discreetly sounded the Directors of the Companies, and had ascertained something of the basis upon which they were willing to treat. There had now to be made very careful calculations as to whether the Corporation could make an acceptable offer, and at the same time see their way to a profit upon the working of the business. Ultimately a provisional agreement was come to for the sale of the Birmingham Gas Company's business for £450,000, and of the Staffordshire Company's undertaking in return for perpetual annuities equal to the maximum dividends payable by the Company upon their capital—viz., 10 per cent. on £320,400 and 7½ per cent. on £350,000. The Corporation were to derive their profit first from the increase in the demand for gas, and secondly from economies of management to be effected by combining the two concerns. Mr. Chamberlain persuaded the Council that there was a hopeful prospect attending the acquisition; and he was equally successful in the advocacy of the principle involved before the Parliamentary Committees. He showed infinite tact and resource in dealing with various local bodies who appeared in opposition, and particularly the outside governing authorities, such as Walsall and West Bromwich, who claimed the right to purchase their share of the undertaking. The Birmingham Gas Bill was successfully engineered through Parliament; and Mr. Chamberlain devoted himself with no small assiduity to the working of the undertaking. He took the Chairmanship of the Gas Committee, and gave the most minute attention to every detail. The result was that the concern was put upon a business foundation, which has since been preserved and developed to the no small advantage of the city. In 1879, Mr. Chamberlain reviewed the results of the purchase, which at the time were stated as follows: Carried to the relief of the rates, £80,000; set aside for the reserve fund, £50,000; for sinking fund, £35,000. Meanwhile two reductions in price of 3d. per 1000 cubic feet had been made in the three years, amounting to a sum of £60,000 per annum; the gas at the same time being of higher quality than formerly—in fact, it compared favourably with that of other boroughs.*

"No sooner had the gas-works purchase been negotiated, and before the Bill was obtained authorizing the Corporation to embark upon the enterprise, than Mr. Chamberlain was busy with the question of the acquisition of the water-works. This was not proposed for the sake of adding to the revenue, but as a sanitary measure, and to enable the Council to close the numerous polluted wells which abounded in the town. The Water-Works Company refused to be bought out; and the Corporation had to seek powers to make them sell. Mr. Chamberlain was again the chief witness before the Parliamentary Committee; and ultimately, in August, 1875, power was given to the Corporation compulsorily to acquire the water-works on payment of 'a full and fair price,' to be settled by agreement or arbitration. The Company at first were disposed to be exorbitant in their terms; but an agreement was ultimately arrived at on the basis of the payment of perpetual annuities equal to the maximum dividends on the called-up capital, 3 per cent. on the authorized capital uncalled, and 4 per cent. per annum on the capital value of half the back-dividends the Company would have been enabled to declare out of future profits. It was a big price to pay; but the Corporation were able to improve the supply, to abolish the old polluted wells that prevailed in the town, and to decrease the water charges until it became necessary to re-impose them to defray the cost of the new supply from Wales."

As a token from the people of Birmingham of their sense of the great obligation they owed to Mr. Chamberlain for his services to the Municipality, especially in connection with the acquisition of the two undertakings above alluded to, a memorial was erected to him by public subscription, and unveiled on October 26, 1880.

DONCASTER CORPORATION GAS SUPPLY.

Some Historical Particulars—A Record of Progress.

Under the auspices of the Gas Committee of the Doncaster Corporation, and with the co-operation of certain tradesmen in the town, an exhibition of gas appliances was recently opened in the Guild Hall by Alderman Wainwright, the Chairman of the Committee. In the vestibule of the hall was placed an incandescent lamp of 1000-candle power; while inside were others of 700, 400, and 200 candle power respectively. The exhibits comprised cooking-stoves, gas-engines, heating apparatus, fittings, burners, meters, &c., all effectively located by the Gas Engineer (Mr. R. Watson), under whose supervision the arrangements had been carried out. In opening the exhibition, Alderman Wainwright gave a few particulars of the progress of gas lighting in the town. He said gas was first made in Doncaster in 1814 by a private individual named George Elliott, who lighted his own premises. Thirteen years afterwards, the Corporation, in conjunction with the public, introduced gas for general consumption; and this showed that the Corporation of that time, despite the gibes that were from time to time made at them, did some good things. The expenditure incurred amounted to £13,000, and the price was 12s. 6d. per 1000 cubic feet. In 1858, the Corporation purchased the gas-works, and that year made 28 million cubic feet of gas, at 3s. 9d. per 1000 feet. At the present time, the quantity made was 191 millions, and the cost to the consumer was 2s. 6d. per 1000 feet, and no meter-rent was charged. The Gas Committee intended to seek further powers with a view to extending

* In connection with this address, it may be mentioned that the "JOURNAL" pointed out that, though the consumers had benefited, as such, to the extent of £60,000, they were being overtaxed to the extent of the £80,000, taken in relief of the rates. At the same time, we fully recognized the speaker's administrative ability, and said that "so ample were the details, and so skilfully were the figures manipulated, that we could half believe that Mr. Chamberlain was bidding for the office of Chancellor of the Exchequer when a Radical Administration is formed." He has not filled this important position; but, curiously enough, his son is doing so, though not in a Cabinet such as that which we then had in contemplation.—ED. J. G. L.

and improving the works; and then, with modern appliances, they hoped to produce gas at a cheaper rate than heretofore. Their object was, of course, to sell gas, as it could be used for various purposes—lighting, heating, cooking, ventilation, and power. The increase in Doncaster in the last 20 years was equal to 150 per cent. The Committee felt greatly encouraged by the progress made in incandescent lighting. They had all been attracted that night by the magnificent lights with which the hall was illuminated. It was proved that incandescent gas-light was the cheapest, most brilliant, and most economical light of the day. He believed its development would eventually place it beyond comparison and competition. In conclusion, he thanked the tradesmen who were exhibiting for their co-operation. He did not wish to praise their officials too much; but their Manager was thoroughly up-to-date, and worthy of their commendation. The Gas Committee were all business men, and imbued with a spirit of enterprise. They were determined to make the works at Doncaster a splendid success for the general benefit of the town.

MANCHESTER CORPORATION WATER SUPPLY.

Proposed New Storage Reservoirs.

At the Meeting of the Manchester City Council on Wednesday—the Lord Mayor (Mr. J. Royle) presiding—the Water Committee presented a report on the subject of a proposed extension of storage. They pointed out that when the Thirlmere scheme was first laid out, it was arranged that of the 50 million gallons of water per day that was available, three lines of pipes, or 30 million gallons per day, might be delivered at the Prestwich reservoir, and the remaining two lines taken from the aqueduct near Hulton by way of Worsley to Denton and Audenshaw. The Engineers, on reconsidering the question, advised that two pipes only, or 20 million gallons per day, should be delivered at Prestwich, and that the other three pipes should convey their supply to the new reservoirs to be constructed at Denton and Audenshaw. The Committee did not consider it desirable to purchase any land or easement for this purpose, owing to the long intervening period; and consequently the time for acquiring it was allowed to expire. It was now necessary to again acquire the right of purchase; and the Engineer (Mr. G. H. Hill, M.Inst.C.E.) had been instructed to make a correctional survey along the line of the proposed pipe from the Thirlmere Aqueduct, near Hulton, to Denton, so that application might be made to Parliament for the requisite powers. It was also necessary that further storage should be provided in connection with the supply from Thirlmere, as the existing reservoirs at Prestwich were quite insufficient to cover all contingencies. It was essential that any additional reservoir to be provided should be constructed at about the same level as the present Prestwich reservoirs; and this condition necessarily limited the sites available. But it was found that it could be met by the construction of a reservoir on the high land on the north-west side of Heaton Park; and the Committee recommended the Council to approve of this site, and authorize the necessary powers being acquired for carrying out the works, as well as the additional reservoirs and works that might be needed at Denton and Audenshaw.

Sir John Harwood proposed that the report should be adopted, and that the Council should instruct the Parliamentary Sub-Committee to make application to Parliament in the ensuing session for powers to carry out the several works referred to therein. He said he wished simply to move the adoption of the report, so that if it was agreed to, the work might go forward, and the Committee would furnish another report fully explaining the whole scheme. He stated briefly that the Corporation supplied 1,200,000 people with water. At the Prestwich reservoir there was only water for two days and two nights; and it was reported to the Committee that it was imperative that they should have more storage. They had been for two years sinking trial holes and taking dimensions, with a view to provide reservoirs at Godley; but they would require embankments of great height, and consequently it meant enormous expense. The question of altitude had limited the choice of sites. It was found that the difficulty could be met by the construction of a reservoir on the north-west side of Heaton Park; and the Committee recommended the Council to approve of this site. They did not propose to go there because the Corporation had bought it, but because it was almost the only place where sufficient altitude for the water could be obtained. He thought the construction of the reservoir would tend to add beauty to the park. It would be 25 feet deep, and would cover a space of 105 acres—45 inside and 60 outside the park. The estimated cost, according to their Engineer, would be £356,000, with about £50,000 for land.

Dr. Dearden complained that the Parks Committee had had no intimation of this matter till a few days ago, and he moved, as an amendment, that the minutes in relation to this particular matter be referred back.

Mr. Ashton seconded the amendment.

Sir John Harwood said this was a matter of the most urgent nature, and must go before Parliament without delay.

Upon a division, the amendment was defeated; and the resolution was then agreed to.

Comparative Cost of Gas and Electricity.—The attention of the inhabitants of Ventnor is being called by the Gas and Water Company to the following comparison between the cost of gas and electric lighting: Electricity for the quarter ending Sept. 29, 1902, £3 5s. 6d.; gas, for the corresponding quarter of the present year, 19s. 9d.—showing a saving in favour of gas, with Kern burners (giving four times the light furnished by electricity), of £2 5s. 9d. These figures, which the Company are prepared to verify, should make users of electricity open their eyes.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 93.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19½—20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	230—235	−5	5 2 2
300,000	,,	,,	9	Do. New	173—173	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	150—135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
220,000	Stk.	Sept. 11	10½	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk.	145—150	..	5 3 4
460,000	20	Mar. 31	10	British	39—40	..	5 0 0
100,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c.	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	88—93	..	4 16 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅞—11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8¼	Cagliari, Ltd.	2⅝—2¾	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5 5/10	Commercial 4 p.c. Stk.	105—108	..	4 16 3
503,750	,,	,,	5	Do. 3½ p.c. do.	99—102	..	4 18 9
442,947	,,	June 11	3	Do. 3 p.c. Deb. do.	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120—125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—140	..	5 0 0
575,000	Stk.	Aug. 27	5⅛	Crystal Palace Ord. 5 p.c.	112—117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—123	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	17½—18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12⅝—13⅝	..	5 16 8
15,243,200	Stk.	Aug. 13	4 4/10	Gas-light and Coke	4 p.c. Ord.	87—89	+3	4 18 11
					3½ p.c. max.	85—87	..	4 0 6
					4 p.c. Con. Pref.	104—107	..	3 14 9
					3 p.c. Con. Deb.	87—89	..	3 7 5
2,600,000	,,	,,	3½					
3,799,735	,,	,,	4					
4,193,975	,,	June 11	3					
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental	203—205	+2	4 17 7
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99—102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A	214—216	..	4 12 7
718,100	,,	,,	7	Do. do. B	163—165	+½	4 4 10
306,083	,,	June 26	4	Do.* do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of Melbourne	5 p.c. Deb.	101—105*	..	4 15 3
250,000	100	,,	4½		4½ p.c. Deb.	100—102*	..	4 8 3
541,920	20	June 11	3½	Monte Video, Ltd.		9—10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.		103¾—104¼	..	4 6 2
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.		98—99	..	3 13 8
300,000	Stk.	May 14	8	Oriental, Ltd.		140—145	..	5 10 4
600,000	5	Sept. 30	7	Ottoman, Ltd.		5—6*	..	5 16 8

* Ex div.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6½	Ply'mth & St'house 5 p.c	123—128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	11½—11¾	..	5 19 2
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 30	8	San Paulo, Ltd.	11—12*	..	6 13 4
135,000	Stk.	Sept. 11	10	Sheffield A	235—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—236	..	4 4 9
523,498	,,	,,	10	Do. C	233—236	..	4 4 9
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	101—112*	..	4 9 3
6,150,000	Stk.	Aug. 13	5½	South Met., 4 p.c. Ord.	116—119	+1	4 9 [illegible]
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	87—90	+½	3 6 8
380,940	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton	A. 5 p.c.	115—120	..	5 0 0
313,020	,,	,,	4½		B. 3½ p.c.	95—100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.		8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		58—100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.		93—98	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅝	Chelsea, Ord.		305—315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pref.		147—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		132—137	..	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb.		135—140*	..	3 4 4
1,720,560	Stk.	Mar. 31	8	East London, Ord.		208—213	..	3 15 1
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.		138—143	..	3 2 11
1,282,913	,,	,,	3	Do. 3 p.c. Deb.		92—95	..	3 3 2
700,000	50	June 11	10	Grand Junction	10 p.c. max.	122—127	..	3 18 9
310,000	Stk.	Sept. 30	4		4 p.c. Deb.	120—125*	..	3 4 0
708,000	Stk.	Aug. 13	10	Kent		275—285	..	3 10 2
160,000	,,	,,	7	Do. New, 7 p.c. max.		190—200	..	3 10 0
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.		292—297	..	3 14 0
406,200	100	,,	8½	Do. 7½ p.c. max.		210—220	..	3 17 3
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.		120—125*	..	3 4 0
500,000	100	Aug. 13	12 5/10	New River, New Shares		385—395	..	3 4 9
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.		121—124	..	3 4 6
902,300	Stk.	June 11	7½	South-wark and Vauxhall	Ord.	225—230	+2½	3 5 3
126,500	100	,,	7½		7½ p.c. max.	210—220	..	3 8 2
489,200	Stk.	,,	5		5 p.c. Pref.	145—150	..	3 6 8
1,019,585	,,	Mar. 31	4		4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex		270—280	..	3 11 5
200,000	,,	,,	4½	Do. 4½ p.c. Deb.		133—138	..	3 5 3
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.		92—95	..	3 3 2

* Ex div.

LAND ARBITRATION CASE AT WESTON-SUPER-MARE.

An arbitration has just been held at Weston-super-Mare with regard to a claim by Mr. Francis Blackmore against the Gas Company in respect of the compulsory acquirement of certain land belonging to him which the Company needed for the extension of their works, and damage thereby caused to his adjoining land not so taken. The Arbitrators were Messrs. Robert Sturge and Joseph Lean; while Mr. C. R. Wainwright, of Shepton Mallet, acted as Umpire.

In giving evidence in support of his claim, Mr. Blackmore said the land which was being taken over by the Company, as well as that which was left, was quite ripe for building; but he had so far kept it vacant, as he realized that it would become much more valuable to him by waiting. The extent of the land was 2½ acres, and he put the value at £1500 an acre, from which the cost of making roads would, of course, have to be deducted. He admitted that near the land there were the gas-works, refuse-heaps, slaughter-houses, and a hospital; but he maintained that these would not detract from the worth of the property as a building site for artizans' dwellings. Mr. A. P. I. Cottrell, surveyor, detailed a scheme which he had prepared for the laying out of the land. It comprised 46 plots, which he should say would command an average ground rent of £2 12s. 6d. This, at 25 years' purchase, would represent £3108, which, after making certain necessary deductions, he would reduce to £2072. As to the land which would remain, he should estimate the damage at £175. The fact that Mr. Blackmore obtained nearly 7 acres of the land for £800 some years ago, did not affect his valuation at all. Mr. M. J. Cross, auctioneer, put the net value of the land at £2157; Mr. S. J. Wilder, architect, at £2030; Mr. Saturley, auctioneer, at £2806; and Mr. C. E. Masters, F.A.I., at £2500.

On behalf of the Gas Company, Mr. F. W. Wills, architect, said he did not consider the land ripe for building. He estimated that 38 houses could be erected; and £1 15s. a plot ground-rent would be fair. His valuation of the land, at 22½ years' purchase, was £1495 gross; or, after making due allowance for development expenses, £667 net. As to the land which was not taken, the extension of the gas-works would not reduce the value of the ground-rents. Mr. W. T. Howes thought that, if placed on the market, the land as a whole would fetch about £825. Mr. Blackmore would be fortunate if he got £300 an acre for it. Mr. Hans F. Price, architect and surveyor, and Chairman of the Gas Company, said the land was suited to be laid out in 38 plots. A ground-rent of 30s. a plot would be fair; and 22 years' purchase was reasonable. He considered £631 to be the value of the land. Mr. Salonde's net valuation was £694; but he admitted that he based this on the assumption that Mr. Blackmore would have no right to use the road abutting on the land—this being the Company's contention. Other witnesses were called, who practically supported these figures.

The Umpire reserved his award.

ELECTROLYSIS OF WATER-PIPES IN BOSTON (MASS.).

For several years the Engineers of the Distribution Department of the Metropolitan Water-Works of Boston (Mass.) have from time to time made measurements of the electric currents following the pipes of the system; and at some points where damage from electrolysis seemed to be taking place most rapidly, the pipes have been uncovered for examination. Recently evidences of extensive and serious injuries to the pipes have attracted attention, and the legal aspects of the situation are being considered by the Attorney-General of the Commonwealth. In this connection, the statement on electrolysis contained in the report of the Metropolitan Water Board for last year, an abstract of which has been given in "Engineering Record," is of especial interest.

At one of the small drawbridges between Boston and Cambridge, the electric cables of the street railway and two very heavy 36-inch mains of the Metropolitan system cross the Charles River beneath the water. The return current on the street railway cables, early in the summer of 1902, "was discovered to be grounded, passing into, and thus endangering, the pipes. The matter was reported to the Street Railway Company in June; and measurements taken in July indicated that the leakage of electricity had been stopped."

Not far from the bridge just mentioned there is a large power station belonging to the Railway Company; and in its vicinity the electrolytic action upon the mains, which are 48 inches in diameter, has been especially severe. In June, 1902, a communication was received from the Company, asking for the co-operation of the Board in making experimental tests of methods of preventing the electrolytic action. After some conferences, permission was given the Company to proceed with the work. An attempt has been made to protect the pipes at three points where it was thought the greatest damage was being done. One section, 26 feet long, located opposite the power station, one 77 feet long, crossed by three lines of tracks entering a car-house, and one 39 feet long under two lines of track, have been treated in the following manner: The pipes were first thoroughly cleaned with scrapers and wire brushes. A coat of asphalte paint was then applied, and over this a layer of Warren's Kiola rock asphalte wire composition was laid on hot. The pipe was then wrapped round, and another layer of hot asphalte was put on. The insulation was applied in short sections, which overlapped about 6 inches at the junction lines, and when completed was from one-quarter to half-an-inch in thickness. As the trench was refilled, three lines of old tram-rails were laid in the trench parallel with the axis of the pipe, and about 6 inches from the bells at the nearest points. These rails were connected to the pipe-line by means of copper bonds soldered to the pipe-bells near the ends of each insulated section. The rails were also connected at the ends with similar copper bonds. Where the pipe-line was located under the car tracks, the rails were placed in a horizontal plane directly over the pipes, and opposite the power station; where there are no tracks in the

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

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street they were placed in a vertical plane. Arrangements have been made so that the quantity of electricity flowing off from the rails can be measured, and also that flowing on the pipes. All the pipes insulated showed the effects of the electrolytic action, and some of them had been very badly damaged. Careful measurements and plaster of Paris impressions of many of the pittings were made, for future reference. On one pipe there were about 80 pittings, varying in size from circles ¼ inch in diameter to banks 30 inches long by 1 inch to 1½ inches in width, and from 1-16th to 9-16ths of an inch in depth.

THAMES VALLEY AND GORING WATER SUPPLY.

In the "JOURNAL" for the 18th of August, we recorded that the Royal Assent had been given in the preceding week to the Water Orders Confirmation Bill. Among the Orders grouped therein was one applied for by the Goring and Streatley District Gas and Water Company, Limited, to enable them, among other things, to construct and maintain additional works, extend their limits of supply, raise more water capital, and change the name of the Company to "The Thames Valley and Goring Water and Gas Company, Limited." One section of the new works consisted of the construction of a covered high-service reservoir situate at Greenmore Hill. The Company have not allowed much time to elapse before carrying out some of their new powers, for on the 1st inst. water was conveyed into a temporary tank, and, for the first time in the history of the place, the people of Woodcote and of the hill country all around had at their disposal an abundant supply. The tank is of cast-iron, and will hold 2500 gallons; but a much larger one of brick and concrete, capable of containing 160,000 gallons, will be commenced at once. Until this is finished, the present one will be made to serve. It stands on the highest spot in the district, and from it the water will flow by gravitation to all parts of the parish, which is of considerable extent. Some little time must elapse before the distributing pipes will be laid; but as they are put down, stand-pipes will be erected and connections made, in order that water may be at the command of all. The new pumping machinery erected at the Cleve reservoir has a lifting capacity of 6500 gallons per hour, and the water is delivered into the new iron auxiliary reservoir by a pumping main laid to Woodcote. This will enable the Directors to at once dispose of at least 50,000 gallons per day, leaving sufficient for the necessary work in the construction of the superintendent's house, &c., and the brick and cement reservoir already referred to. It will be seen by an advertisement which appears elsewhere, that the Directors are inviting tenders for carrying out this work, and supplying and laying 12 miles of main, the whole of which is to be completed within seven months. It will prove an inestimable boon to the district; for the water supply has for some time been in a very unsatisfactory—not to say dangerous—condition. Various schemes were devised for effecting improvement; but they failed to obtain the sanction of the Local Government Board. A suggestion was thrown out that the Goring Company, who had facilities at hand for furnishing a supply, should be invited to do it. At first there was considerable opposition to the proposal; but this was effectually overcome. The necessary powers and the capital required were obtained, and already the Company have afforded proof that no efforts shall be wanting on their part to place within reach of the inhabitants an ample supply of excellent water.

WATER-WORKS FOR WOODBRIDGE.

The water-works which have been in course of construction for the supply of Woodbridge are approaching completion, and it is expected that their inauguration will take place early next month. They are the result of an endeavour on the part of a number of gentlemen, in the face of much opposition, to bring the town into line with others in respect to sanitary matters; and they have been carried out from the designs of Mr. A. F. Phillips, M.Inst.C.E., of Westminster. The pumping-station buildings consist of engine and boiler houses, coal-store, fitting-shop, &c. The pump, which is driven by a horizontal condensing engine, is a specially designed double-acting one, working in a borehole, and capable of raising from 10,000 to 12,000 gallons of water per hour at a low speed. The boiler-house, which is lofty and well ventilated, is fitted with two Galloway boilers competent to work under a pressure of 100 lbs. per square inch. The water, prior to distribution, will be forced into an elevated steel tank, and raised high enough to supply the whole district. The tank is supported by a circular tower, and is well emphasized at the bottom with a Bramley Fall stone plinth and plinth mould. The shaft of the tower is executed in brickwork, neatly recessed into panels externally, and crowned with a corbel table and bold Bramley stone cornice. This structure has an imposing architectural appearance. The pumping plant and boilers have lately been put under trial, and have given highly satisfactory results. The laying of the mains, which was commenced early in the year, has been completed, with the exception of a few yards, and the work is ready for testing. We learn that the quality of the water derived from the boring is everything that can be desired—being excellent both chemically and bacteriologically; while it will be sufficient in quantity to meet the present requirements and probable growth of the district for some time to come. The pumping engines and plant have been supplied by Messrs. James Simpson and Co., Limited; the boilers by Galloways, Limited; and the mains by Messrs. T. Docwra and Son. The water-tower was erected by Mr. F. Bennett, of Ipswich—Messrs. Thomas Piggott and Co., Limited, carrying out the steel work; and the pumping-station buildings were put up by Messrs. Barrett and Smith, of Woodbridge. The whole of the contracts have been most satisfactorily carried out under the personal supervision of Mr. H. Preece James, the representative of Mr. Phillips.

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WORKINGTON WATER-WORKS EXTENSION.

On Wednesday last, the ceremony of turning on water into the new 21-inch main which the Workington Corporation have laid from Crummock Lake to Broughton Cross, at a cost of over £56,000, was performed by Mr. H. C. Howard, the Chairman of the Cumberland County Council, in the presence of the members of the Workington Town Council and a few of the residents of the locality. The Corporation, by their Act of 1899, obtained possession of the Crummock main basin, and have the sole right of taking water. The watershed of the Crummock basin, according to Mr. Joseph Eden, of Workington, the Engineer engaged by the Corporation, comprises an area of about 16,000 acres of mountain land, and includes three lakes—namely, Loweswater, at an elevation of 397 feet; Buttermere, at 331 feet; and Crummock, at 321 feet—and as a natural reservoir site, with an almost unlimited supply of the purest water, it will be difficult to find its equal in any part of England. After making a very liberal allowance for evaporation and percolation, there may safely be taken as available for storage an average of 30 inches per annum. This, falling over 16,000 acres, gives 10,848 million gallons, equal to nearly 30 million gallons per day, if the fall were uniform and continuous. The area of Crummock Lake before it was raised in accordance with the Act of 1899 equalled 622 acres. A depth of 2 feet on 622 acres gives over 337 million gallons. When raised, the surface area of the lake will be increased by 22 acres, which, at an average of 1 foot depth, gives about 6 million gallons. In case of emergency, however, during a long period of dry weather, the lake might be safely drawn down another foot, giving 162 million gallons, and making a total available storage of 505 million gallons. The daily requirements of the district may be put down as follows: Compensation water, 5 million gallons; drawn off by old pipe, 1 million gallons; by new pipe, 2 million gallons—a total of 8 million gallons. As during the driest season there have never been less than 3 million gallons passing over the gauge weir placed across the River Cocker a short distance down from the lake, in addition to what was passing out through the old pipe, there may be deducted 4 million gallons from the 8 millions, leaving 4 million gallons to be drawn daily from the 505 million gallons. This gives 126 days' supply.

Southport Joint Water Board.—At a recent meeting of the Southport, Birkdale, and West Lancashire Joint Water Board, a resolution of the Finance Commtitee, that a sum of £1000 should be paid into a sinking fund in respect of the costs and expenses of the Southport Water (Transfer) Act, 1901, and that the same be invested in the purchase of Southport Water Company's 5 per cent. debenture stock, was approved, as was also a resolution that £227 should be paid into a sinking fund in respect of the working capital in connection with the undertaking of the Board, and invested in similar stock.

NEW YORK WATER DEPARTMENT.

Administrative Reforms.

According to an article on the above subject in the "Engineering Record," the change which was made rather more than a year ago in the administration of the Water Department of New York, by placing Colonel Monroe at its head, has resulted in greater improvement than had been effected in the ten years preceding his appointment. When he took charge of affairs, he found the department in a peculiar condition. The works built by the Croton Aqueduct Commission and handed over to the city for operation and maintenance, were well known through suitable records. Those in regard to older work were, however, extraordinarily deficient; and even the data at hand had never been collated and indexed so as to be fully available. Consequently, the plant, particularly the distribution system, was largely unknown; and one of the first tasks undertaken by Colonel Monroe was the reorganization of the engineering bureau. Mr. G. W. Birdsall, for upwards of twenty years the Chief Engineer of the department, was appointed to the position of Consulting Hydraulic Engineer; while the reorganization of the engineering office was entrusted to Mr. Nicholas S. Hill, jun., as Chief Engineer. Under his direction, sectional maps on a large scale are being prepared to preserve proper records of the location of mains, valves, and hydrants; while others on a smaller scale, showing the general scheme of distribution, are also nearing completion. The pumping-stations have also received an overhauling which will materially reduce the expense of operating them.

It has been recognized for a long time that this business of distributing water was conducted in a slip-shod manner in New York; but the new administration has been introducing great reforms which no longer admit of such criticism. Hydrants and valves of modern types are being set, and kerb cocks are being placed on the service-pipes, so that it is unnecessary to open the street to the corporation cock at the main in order to shut off the supply to any building. Equally important has been the very careful study of waste which has been undertaken in typical districts of the city, which has thrown much light of a definite nature on a subject usually discussed in general terms. These studies show that the only step to check waste of water which can be taken for the present is to push the use of meters, which is being done on public as well as private premises. By a continuation of these investigations, keeping a careful record of meter readings, extending the use of meters for public supplies, and measuring the flow in the mains, it is hoped to arrive at a fairly accurate knowledge of the quantities of water used and wasted, the leakage in street mains and services, the waste through defective plumbing, and the losses due to extravagance. When these facts are determined positively, it will be possible to apply proper remedies intelligently. The subject is one of vital importance, because the cost of supplying the total amount of water wasted or lost under the present conditions in New York is an enormous

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sum; and the careless habits formed by wasteful consumers are likely to entail even greater expense when filtered water is furnished to the city, which seems inevitable in a few years.

Another important undertaking has been the sanitary patrol and improvement of the 20,000 acres of reservoir lands under the department's control. A careful inspection of the watershed has been made with the assistance of Dr. Lederle, the Commissioner of Public Health; and while no alarming conditions were discovered, abundant opportunities for reform were found. A systematic patrol force has been organized under the charge of an Assistant-Engineer, and maps are being prepared of all the principal settlements and towns which can contaminate the water with their drainage. All nuisances are also plotted on these maps, and records are kept of every step taken to abate them. Lands needed for the protection of the supplies are being condemned, and a comprehensive plan for the sanitation of the watershed is being prepared. Analytical examinations of the water are made regularly at the Mount Prospect laboratory; and a branch laboratory is being equipped at Katonah, where samples of Croton water may be handled more quickly.

The most important undertaking of the department has been the investigation by a Special Commission, consisting of Professor William H. Burr, Chairman, and Messrs. Rudolph Hering and John R. Freeman, to settle four distinct questions—(1) the quality of the present supply and the prevention of waste, (2) the probable future consumption, (3) the best sources from which to procure additional supplies, and (4) the feasibility of developing a temporary supplementary supply. This is the first investigation to be made for what may be called a legitimate engineering purpose; and it is being conducted along lines which enable the very valuable results of the previous inquiries to be utilized and studied, and plans prepared in sufficient detail for making careful estimates of the cost of construction.

Cost of Incandescent Lighting in Stockport.—At last Wednesday's meeting of the Stockport Town Council, Alderman J. Turner referred to the following clause in the minutes of the Gas and Electricity Committee: "The Engineer submitted details extending over a period of twelve months showing that the cost of maintenance on the incandescent lighting system was about 3s. per lamp per annum higher than for ordinary burners. Resolved: That the General Purposes Committee be respectfully informed that, in consequence, this Committee feel it necessary to increase the annual charge for incandescent lamps from £2 15s. 3d. to £2 18s. per lamp per annum from Sept. 29. Alderman Turner thought some details should be given to the General Purposes Committee before any change in the price was made. The Mayor said the matter was not really definitely settled. Further information would be given to the General Purposes Committee. At the request of Alderman Turner, the Mayor said that he would bring the matter before the Committee again. The clause was thereupon referred back.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The filling up of the post of Gas Engineer to the Corporation of Glasgow was advanced a stage yesterday, when the Special Sub-Committee to whom the matter has been remitted interviewed the six candidates who are on the short leet. The Committee are to meet again on Monday; and it is anticipated that they will then be able to arrive at a definite decision as to whom they are to recommend for the appointment.

Two months after the usual date, the accounts of the Glasgow Gas Department for the year ending May 31 last were approved by the Town Council on Monday. The delay this year was most probably partly caused by the lamented death of Mr. William Foulis, but, to a greater extent it was due, it is safe to say, to the division of opinion within the Gas Committee upon the question of differential prices for gas. The selling of gas for power purposes at a cheaper rate than for lighting appeared to one of the councillors to be an attempt to boom the gas-engine; and he opposed it tooth and nail on that ground. He fancied that an advantage would be given to the manufacturers of gas-engines if the Corporation provided gas at a cheap rate to drive them. This was sufficient reason for him saying, with all the force at his command, that it should not be. The other consideration, that there might be situations and occupations where a steam-engine would not be suitable, and the fact that by the use of gas-engines in such places some thousands of people might find employment in the city, and the Corporation would get a return upon capital outlay—these raised questions of what would be equitable, and were beyond his grasp. It may not be the duty of the Corporation to boom gas-engines; but it is their duty to foster trade, for the benefit of the community, and particularly so when they are themselves large manufacturers of a raw material which is used in trade. Their proposal was to sell gas for power purposes at 1s. 10d. per 1000 cubic feet. Last year the cost of producing gas in Glasgow was at the rate of 1s. 9¾d. per 1000 cubic feet; so that, upon the manufacture there would have been ¼d. per 1000 feet over to meet the cost of distribution and management. Upon the 300 million cubic feet of gas sold for power purposes, this would have amounted to £312, which would have gone far to meet any extra cost upon these heads. But there is to be taken into account, in addition, that the Corporation pay, in round numbers, £60,000 a year interest upon borrowed money. The quantity of gas taken for power purposes last year was about one-twentieth of the whole consumption. The interest on this is £3000. This is, on the most extreme assumption, the sum which the Corporation would have sacrificed yearly at the present moment if the price had been fixed at 1s. 10d. The proposal was rejected; and the price remains at 2s. per 1000 cubic feet for power purposes. That is, 2¼d. per 1000 cubic feet has been added to the cost price of production,

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WRITE FOR OUR

"MAINTENANCE" PAMPHLET,

OF "INTEREST" TO ALL GAS OFFICIALS.

CANNON IRON FOUNDRIES, LTD.,

Gas-Stove Department,

DEEPFIELDS, Near BILSTON, STAFFS.,

And Bath House, 57-60, Holborn Viaduct, London, E.C.

which, upon last year's consumption of 300 million cubic feet, amounts to £2812. This is not far short of the £3000; and, considering the demand is a growing one, it may be assumed that the Corporation will incur no loss by reason of the differential rate they have adopted. These figures bring out how very correct, from a business point of view, is the decision which the Gas Committee arrived at when the Corporation practically forbade them to sell gas at a loss. They also show how infinitesimal was the amount which the Committee were prepared to sacrifice in order to promote business. I have left out of account the question of competition, which was the chief consideration of the Committee in proposing the lower rate, and have endeavoured to show that, on its merits, the first proposal of the Gas Committee was quite a reasonable one; while what has been adopted—2s. per 1000 cubic feet—is a figure which enables the gas-engine consumption to stand upon its own legs. The principle of charging differential rates I have not touched upon, because there is no principle. It is practice. Differential rates are everywhere in the world. Their justification is necessity. The extended use of gas-engines would greatly increase the number of small manufacturers, and thereby give opportunity for rising in the world to many who, in large factories, are doomed to life long servitude.

The accounts embody the results of the change which has been introduced into the finances of the undertaking by the scheme for the conversion of stock. This scheme has been in view for some time, and has not been brought into operation in any way which would suggest concealment. Yet at the Council meeting on Monday, Bailie Ferguson, one of the most prominent members, bewailed the fact that they had to go on paying in perpetuity what he called interest—by which I presume he meant annuities. He was either unaware of the existence of the scheme, or he looks upon it as of little avail. The latter view is about correct. A grievous blunder was made in 1869, when the gas transfer took place, in fixing annuities in perpetuity. Perhaps this was due to want of experience; but the effect was, as Bailie Burrell endeavoured to bring home to the Council, that the value of the annuities followed the Money Market, and very soon appreciated to a very considerable amount. In this state of matters, the Council have gone on paying the annuities of 9 and 6¾ per cent. until last year. Now they have made a considerable beginning with the buying up, or conversion, of the annuities. But what is the effect of their scheme? They get rid of annuities; but they have to pay interest upon three times the amount, and so far as gain or loss is concerned, the matter is about as broad as it is long. Nine per cent. upon £100 is exactly the same as 3 per cent. upon £300. There is a saving of £3132 a year in the charge for stock capital; but this is the amount which has been gained by applying £104,816 of the sinking fund to the cancelling of annuities. There, again, the matter is about as broad as it is long, because they lose the interest which they were wont to receive upon their invested sinking funds. The conversion scheme is thus not a financial gain to the Corporation. In the way of unification of the debt of the city, it may be an advantage; but this will be only partially realized unless the Corporation have power to wipe out the whole of the annuities, which I do not think they have. Conversion, therefore, not resulting in a saving, it seems a pity that it should have been inaugurated at a time when the capital account is being augmented in connection with the erection of the Provan works. The system of finance is quite sound; but the circumstances are such that, if the Corporation wish to get rid of paying annuities, they must find for the annuity-holders as much money as would pay the annuities in perpetuity. Of course, the annuity stock will be extinguished, and the sinking fund will, by and bye, pay off the debt incurred in its extinction. But it will have been paid for; and thus, so far from gas consumers of the present day, as was contended for by Mr. A. Murray, receiving benefit from what their forefathers did, they are actually undertaking a burden which they derived from their forefathers, and which they might well have handed down to their successors. It was depreciation which troubled Mr. Murray. In his opinion, they were not allowing sufficient upon this score; others thought they were allowing too much. Who is to decide? Well, the Corporation themselves are the final arbiters in that, as in other matters, under the guidance of expert officials who are acquainted both with the capacity of the undertaking and the statutory requirements. The rate of depreciation has been fixed for many years; and the accounts show that the allowance has been ample. The operation of depreciation and sinking funds is a matter upon which there is wide diversity of opinion. The Corporation here seem to be on safe and sound lines. In fact, all through them, the accounts make it clear that the gas undertaking is exceedingly well appointed in finance. There were a few grumblers at the statement; but they were only as the fly on the chariot wheel.

At a meeting of the Irvine Town Council on Tuesday, Bailie Kirkland moved that steps be taken to secure an arrangement providing for the municipalization of the gas lighting of the town by taking over the Gas Company. After discussion, the motion was rejected by eleven votes to three.

It was as I expected with reference to the managership of the Aberdeen Gas-Works. It did not lie with the Gas Committee to make the appointment, but to recommend. As we know, they recommended Mr. Samuel Milne, the Assistant-Manager; and it is a pleasure to find that the Town Council on Monday ratified the selection. Mr. Milne therefore now holds the position of Manager.

The Town Council of Falkirk are again on the look-out for a gas-works site. Last week they held a meeting, in private, to consider the subject. They discussed it at length. Provost Weir and other members expressed the opinion that, in view of the increase in the burgh rates, and the extent to which the electric current was likely to be utilized for lighting and power purposes, nothing should be done in the matter at present, and the subject of erecting a new gas-works should be left to the ratepayers at the forthcoming election. Three sites were mentioned—the formerly adopted one at Thornhill, one at Forganhall, and a third at Woodburn. A Committee were appointed and instructed to visit the places mentioned, and to report.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 10.

Sulphate of Ammonia.

Although there has been a fair amount of direct buying, supplies have been more abundant, and prices have barely been maintained. The closing quotations are £12 5s. per ton f.o.b. Hull, and £12 7s. 6d. per ton f.o.b. Liverpool and Leith. Interest in the forward position is sustained, and further sales have been made for delivery over the summer months at £12 10s. per ton f.o.b. Leith. Makers' quotations for January-June are £12 12s. 6d. per ton f.o.b. at the ports; but this price has not been reported paid.

Nitrate of Soda.

This is firm in all positions, and spot prices remain 9s. 10½d. per cwt. for ordinary quality, and 10s. 3d. per cwt. for refined.

LONDON, *Oct.* 9.

Tar Products.

The markets remain in about the same position; and there is very little business doing. Benzol continues firm; 90 per cent. being in strong demand for prompt delivery, for which makers as a rule ask 10d. In 50-90 per cent., there is no business to report. Consumers decline to advance their offers for same. In toluol and solvent, there is no business to advise; there being an absence of demand for these articles. Heavy naphtha is still selling very freely for both home consumption and export. In crude carbolic acid, a steady business is being done at 1s. 6d. for October-December delivery; while sales are advised at 1s. 6¼d. for October-March. Creosote is still in strong demand for early delivery; but prices remain about the same, although makers in the North of England as a rule ask rather higher figures. In pitch, there is no business to advise; and, owing to the very low offers made for next year, prices have a decidedly downward tendency. As regards prompt delivery, there is very little offering; and makers do not appear to have any stocks. In tar, there is nothing fresh to advise; but the general tone of the market is, if anything, slightly easier.

The average values during the week were: Tar, 23s. 6d. to 30s. 6d. Pitch, London, 51s. 6d. to 52s.; east coast, 50s. to 51s.; west coast, 49s. 6d. to 50s. Benzol, 90 per cent., 9½d. to 9¾d.; 50-90 per cent., 7½d. Toluol, 6¾d. Crude naphtha, 3d.; solvent naphtha, 7½d. to 8d.; heavy naphtha, 9d. to 10d. Light oil, 1⅞d. to 2¼d. Creosote, London, 1 7/16d. to 1½d.; North, 1¼d. to 1 5/16d. Heavy oils, 2⅛d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8. Salts, 25s. to 27s. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is decidedly quiet for prompt delivery; but for forward, there is very good business doing. The Gaslight and Coke Company still quote £12 12s. 6d. for early delivery, but would probably accept something less than this if a definite offer was made to them. Business is reported f.o.b. London at £12 13s. 9d. for January-April, which certainly seems a very high price considering the present state of the market for prompt. The South Metropolitan Company are asking £12 11s. 3d. for prompt, but would probably consider an offer of something less. In Hull, business has again been done at £12 5s. for October; but this certainly is the full market value for prompt, although £12 6s. 3d. is reported to have been declined for November-December. In Liverpool, some small sales have taken place at £12 6s. 3d. for prompt shipment; but makers at present decline to offer forward. In Leith, there is really no demand for prompt shipment. The nominal value may be taken at £12 6s. 3d., at which it is reported a small sale was made to-day; but an offer of £12 10s. was again declined for November-April delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Only a dragging sort of business is still the general report throughout the coal trade of Lancashire, with four days representing about the full average that pits are running. This restricted output, however, is ample to meet requirements. The colder spell of weather is perhaps giving a little more briskness to the house-fire trade; but the better qualities of round coal still move off indifferently for the time of the year, and prices are not more than steady at recent quotations. Best Wigan Arley remains about 13s. 6d. to 14s. 6d. per ton at the pit, seconds Arley and Pemberton four-feet 11s. and 11s. 6d. to 12s. 6d., with the commoner sorts of house-fire coals ranging from 9s. 6d. to 10s. 6d. The position with regard to other descriptions of fuel remains very much as reported recently. Common round coals at most of the collieries are hanging, and prices are barely maintained at late rates, especially where surplus output under load has to be moved away. Very low prices continue to be quoted to effect clearances for shipment, as these do not appreciably affect the home market. Steam and forge coals can be bought for inland sale at 7s. 9d. to 8s. 3d. per ton at the pit, with some of the better qualities quoted 8s. 6d. to 8s. 9d. Special quotations for cargoes delivered at the Garston Docks or the high-level, Liverpool, are still being made as low as 7s. 3d., representing about 9s. per ton at the ports; but ordinary quotations may be given at about 9s. 6d. to 9s. 9d. The better sorts of slack are fairly steady at about 6s. 3d. to 6s. 9d. per ton at the pit, with medium qualities averaging 5s. 3d. to 5s. 9d., and common sorts 4s. to 4s. 6d. Coke manufacturers report an active inquiry for both furnace and foundry qualities, and have no difficulty in maintaining their full quotations.

Northern Coal Trade.

There is rather a lessened demand for some classes of coal; but, on the whole, the output of the collieries is maintained, and is generally

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well taken up, though the exports of fuel to the Baltic are now beginning to fall sharply off to the upper ports. Best Northumbrian steam coals are quieter, and the price is weak at 10s. 6d. per ton f.o.b., second-class steams are 8s. 9d. to 9s., while steam smalls are easy at 5s. 3d. The gas coal trade is quiet so far as the export demand is concerned; but the home trade is growing very steadily. Durham gas coals vary from 8s. 3d. to 9s. per ton f.o.b., according to quality, and some sales are now being made for forward contracts at rather lower prices than those they replace. Gas coke is much more plentiful, and the price is weaker at the inland works; but for export, the demand is steady, and the price has not changed much in the week.

Scotch Coal Trade.

Business still keeps large in volume, but uneventful. Prices remain unchanged. They are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 6d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 254,864 tons—an increase of 30,747 tons upon the previous week, and of 13,615 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,433,271 tons—an increase of 298,718 tons upon the same period of last year.

Incandescent Gas for Church Lighting.—St. Mary's Church, Nottingham, has just been fitted up with incandescent gas-lights. There are in the church 14 standards, each of which formerly had 21 jets; but under the new system, 5 jets, fitted with incandescent mantles, have been found more adequate. They are lighted and extinguished by electricity. The alteration in the lighting was carried out by a local firm for the Instantaneous Gas Lighting Company.

The Gaslight and Coke Company Fined.—At the Bow Street Police Court last month, before Mr. Marsham, the Gaslight and Coke Company were summoned by the London County Council for supplying gas of less illuminating power than 16 candles. Mr. Jesse W. Godfrey, who supported the summons, said the gas was tested on the 27th of July, at the testing-station, in Spring Gardens, and was found to be of only 15·42-candle power. The Company appealed to the Chief Gas Examiner (Lord Rayleigh), but afterwards withdrew the appeal and fully admitted the offence. The Magistrate imposed a fine of 40s, and allowed £2 4s. costs.

Cost of Water and Electric Lighting at Crewe.—In proposing an increased general district rate at Crewe for the next half year, Mr. C. H. Pedley, the Chairman of the Finance Committee, said the water supply account showed a loss of £1000 a year. He thought they had a good case to go before the Railway Company and ask for a reduction in the charge per 1000 gallons, so as to reduce the amount of the deficiency. Then the electric lighting of the streets was costing them a penny in the pound more than gas. Mr. Sharpe remarked that it was strange the Council could not make their water supply account pay itself. They ought to so adjust matters that there would be no loss. The rate was passed.

Sales of Gas and Water Stock.—£4000 of new 5 per cent. maximum ordinary stock in the Weston-super-Mare Gas Company was sold by auction last week; the prices realized ranging from £109 to £114 per £100 of stock. Last Thursday, Messrs. Alexander, Daniel, and Co. offered for sale £15,000 of Bristol Water-Works 7 per cent. maximum consolidated ordinary stock. The sale realized £22,076; the average price being £147 3s. 6d. per £100 of stock.

Italian Gas, Electricity, and Water Undertakings.—According to a table published in last Wednesday's "Financial News," there has been considerable appreciation in the value of shares in the above undertakings during the present year. On Dec. 31, 1902, the nominal share capital was as follows: Gas and electricity works, 59,100,000 lire; water-works, 40,900,000 lire. On June 30 the Bourse values were 93,736,000 lire and 69,112,400 lire respectively; while on Sept. 30 they had gone up to 97,570,000 lire and 71,237,200 lire.

Advances by the Public Works Loan Board.—According to the twenty-eighth annual report of this Board, just issued, the Loan Commissioners during the financial year 1902-3 made 2063 advances for sums amounting altogether to £5,740,538, compared with 2003 advances for £6,650,021 in 1901-2. Of the first-named sum, £5,626,186 was advanced on the security of the local rates, and £114,352 on the security of property. The rates of interest receivable in respect of the £5,740,538 are an average of £3 5s. 1d. per cent., against £3 3s. 7d. per cent. in 1901-2, £3 1s. 10d. per cent. in 1900-1, £2 17s. per cent. in 1899-1900, £2 15s. 6d. per cent. in 1898-9, £2 18s. per cent. in 1897 8, and £3 10s. 3d. per cent. in 1896-7.

Cirencester Gas Company, Limited.—The annual general meeting of this Company was held on the 26th ult., when the Directors reported that the sale of gas in the twelve months ending the 30th of June exceeded 40½ million cubic feet, which they said was a record, and in excess of that of the preceding year by upwards of 3 millions. The sale of gas produced a revenue of £8111; and the total receipts were £10,115. The expenditure being £7484, there was a sum of £2631 to go to the profit and loss account, the balance standing to the credit of which was £3231. This allowed of the payment of dividends at the rates of £11, £7 14s., and £5 10s. per cent. on the several classes of shares, and the placing of £150 to a depreciation account.

Municipal Petroleum Gas-Works.—New municipal gas-works were opened a short time ago at Drohobicz, in Galicia. According to the "Petroleum Review," the plant for manufacturing petroleum gas was carried out to the designs of Herr A. Teodorowicz, the Manager of the Lemberg Gas-Works. It is calculated to supply 450 street-lamps and 3000 private lights—*i.e.*, for a daily output of 42,000 cubic feet of petroleum gas. The yield of 220 lbs. of Galician petroleum, with a specific gravity of ·880 to ·900, is 2000 cubic feet of gas and about 77 lbs. of tar. The illuminating power of oil gas is 45 candles, and the heating power 9900 calories; the specific gravity of the gas being ·750. It is stated to be perfectly free from ammonia, and only has to be purified from sulphuretted hydrogen.

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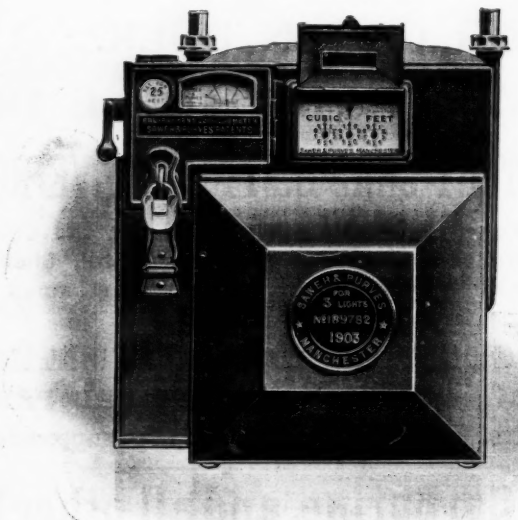

THE "POSITIVE" DRY METER

Discontinuance of Electric Lighting at St. Austell.—A notice has been issued to the inhabitants of St. Austell, on behalf of the United Kingdom Tramway, Light Railway, and Electrical Syndicate, Limited, that the supply of current will be suspended on the 19th inst. in respect of the supply from 8 a.m. to 5 p.m., and on the 30th in respect of that from 5 p.m. to midnight.

Audit of the Liverpool Gas Company's Accounts.—At the last meeting of the Electric Power and Lighting Committee of the Liverpool City Council, it was resolved—"That in the opinion of this Committee it is desirable that an application should be made to the Court of Quarter Sessions for the City to appoint an accountant to examine and report upon the accounts of the Liverpool Gas Company for the year ended the 30th of June, 1903."

Public Lighting of Tilehurst.—Some four years ago, the Reading Gas Company stated that they were prepared to light the streets of Tilehurst on very favourable terms; but the number of ratepayers in favour of the improvement was not sufficient to warrant the Parish Council going forward with the scheme. Early in the present year, however, the question was again considered, and the necessary two-thirds majority was secured on a poll. Some of the lamps have been lighted; and they are causing general satisfaction in the district.

The Surcharges in Shoreditch.—On Wednesday evening the Shoreditch Borough Council had under consideration the following recommendations of the Law and Establishment Committee with reference to the recent surcharges on 14 members in respect of the rate deficiency: "That an appeal be made by the Borough Council against the rate deficiency surcharges, and that the Town Clerk be instructed to engage Counsel to apply for a rule *nisi* for a writ of *certiorari*, and take all necessary steps and incur all necessary expenses to prosecute such appeal to hearing; and that the members surcharged in respect of the deficiency in rates, with the exception of Mr. Councillor Howlett, should appeal to the Local Government Board to remit the surcharge, and that the legal right of the Auditor to make this surcharge be contested by Mr. Councillor Howlett as a test case, by writ of *certiorari* in the King's Bench Division, as it is necessary to join one member with the Borough Council in such appeal." The recommendations were adopted unanimously, without discussion.

The Electric Lighting Muddle in Marylebone.—The Local Government Board have informed the London County Council that they have carefully considered the appeal of the Marylebone Borough Council against the decision of the County Council not to sanction (without further statutory authority), the borrowing of £1,274,000 for the purchase of the Marylebone property of the Metropolitan Electric Supply Company, and are of opinion that they have no alternative but to uphold that decision. The Borough Council, anticipating this reply, have already taken steps for promoting a Bill in the ensuing session to obtain the necessary borrowing powers, and other powers which it would have been requisite to acquire for the effective working of the undertaking under municipal ownership and management. It is contended by those who were responsible for the Borough Council's Special Act of 1901 that the technical difficulty which has confronted the Council in raising the necessary loan will be experienced by all local authorities who may desire to purchase similar undertakings under the provisions of the Electric Lighting Acts of 1882 and 1888; and that, without special statutory power, such authorities will not be able to borrow money for the acquisition of any electricity supply property until they have become the undertakers by reason of having completed its purchase.

The Normanton Gas Company and their Employees.—The recent starting of some new exhausting machinery, erected by Messrs. George Waller and Son, at the Normanton Gas-Works was made the occasion of two pleasant social functions. After some explanation had been afforded by the Manager and Secretary (Mr. E. H. Hudson) as to the work to be done by the new machinery and other apparatus, the visitors were entertained by Mr. Mitchell (the Chairman of the Company) and Mrs. Mitchell at the Station Hotel, when cordial expressions of admiration were passed upon the Chairman's interest in the Company's welfare, and upon Mr. Hudson's assiduous efforts to keep the works and plant quite up to date. The whole of the employees were also invited to tea at the Junction Inn by the Chairman, whose health was proposed by Mr. Hudson. In responding, Mr. Mitchell tendered some good advice to the men, and expressed a hope that they would meet more frequently on similar occasions, and that the good feeling existing between the Directors and the employees would continue. The toast of "The Secretary and Manager" was drunk with much enthusiasm, and responded to by Mr. Hudson. A hearty vote of thanks was accorded to Mr. Mitchell for his hospitality. In the course of the proceedings, it was mentioned that Mr. Horsnell had been appointed assistant to Mr. Hudson.

Fire Caused through an Escape of Gas.—At the City Coroner's Court on Wednesday, Dr. Waldo held two inquiries in respect to fires which occurred in the City of London last month. One was at 34-35, Gracechurch Street, on the 9th ult., at 10.30 in the morning. The housekeeper, F. C. Billings, who is also a clerk in the employ of the owners—Messrs. Christy and Co., Limited, hatters—gave evidence, a feature of which was the assertion that the fire was wilfully caused. He based his statement on the fact that a number of times before and after the fire he had discovered the gas-jets on the staircase turned on. In this he was supported by a clerk and typist in the service of other tenants of the building. He could not, however, suspect any individual as causing the fire. Members of the Fire Brigade and the London Salvage Corps put forward a theory to the effect that someone, while tampering with or inspecting the four meters in the cupboard, had disturbed them, with the result that a very small leak had been made in one of the gas-pipes. The escaping gas consequently became ignited; but the ignition was so infinitesimal that it was unnoticed. It increased, however, as the lead melted, until finally a volume of gas was in flame, which culminated in bundles of newspapers stored in the cupboard being lit. The Jury accepted this as the correct view, and returned a verdict that the fire was accidentally caused.

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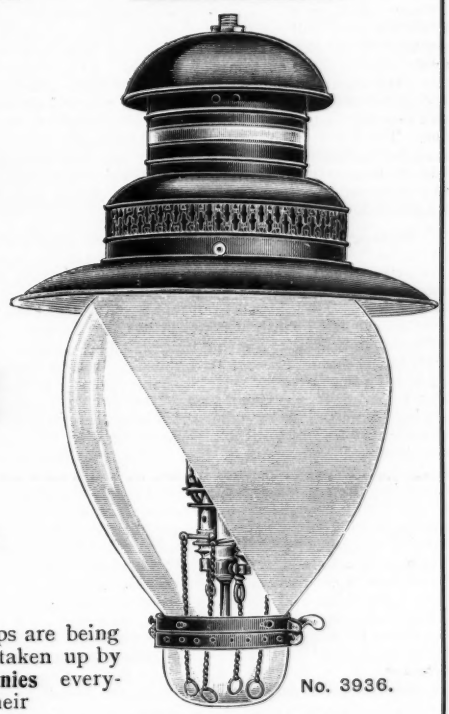

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British Progress in Gas-Works Plant and Machinery.—With the view of stimulating trade in foreign and colonial markets, lectures are being organized with the object of showing the progress made in manufactures, engineering, &c., in Great Britain. They will be prepared by experts in each department for reading before technical societies, Chambers of Commerce, &c.; and we learn that Mr. C. E. Brackenbury, Assoc.M.Inst.C.E., has been entrusted with one on the above-named subject.

Tynemouth Electric Light Works Flooded.—The rainy weather which prevailed in the northern counties during the early part of the past week culminated on Thursday in a perfect deluge; the fall measuring 2·66 inches. Among other damage caused was the flooding to a depth of 6 feet of the electricity works of the Tynemouth Corporation, the effect of which was that the Town of North Shields and other parts of the borough presented a weird appearance on Friday night. The large arc lamps in the main thoroughfares cast no lights upon the roads, and the ordinary lamps were greatly missed. Tradesmen were put to much inconvenience on the busiest night of the week except Saturday. Those who had not removed their gas-fittings had a fairly brilliant light; but other people resorted to paraffin lamps or candles.

Torpoint Water Supply.—For some time past the St. Germans Rural District Council have had under consideration the question of providing an adequate water supply for Torpoint and other portions of the district immediately bordering upon the Cornish side of the River Tamar. In large measure, the proposal is the outcome of suggestions from the naval and military authorities, who are about to increase the training establishments and defences on that side of the river, and promise to be good customers for water. At a meeting of the Council last Thursday, a scheme was submitted by a Committee who had been appointed to consider the matter. The cost was estimated at £44,000, and they recommended that a Bill should be promoted for carrying it out. The District Council adopted the scheme, and decided to submit it to the Saltash Town Council, with a view to obtaining their adhesion. Saltash is now supplied with water by the Plymouth Corporation; but negotiations have been carried on with a view to inducing it to become a partner in the new undertaking.

Destructive Action of Sea Water.—Correspondence has been going on in the "Daily Chronicle" on the subject of the waste of water, and one writer called attention to the fact that the daily consumption per head of the population is 35 gallons in Brighton, and only 16 gallons in Hastings. He inferred from this that the Brighton people must be needlessly extravagant. An article in the "Lancet," however, puts a different complexion on the matter. The smaller consumption at Hastings is due to the fact that the Corporation have for some years been using sea water for sprinkling the streets and flushing the sewers. The experiment promised well. Not only did they save money by drawing from the new inexhaustible supply close at hand, but the salt water was found to exert a binding action on the road surfaces, and thus lessened the amount of dust. Moreover, the supply of sea water to the bath-rooms of private houses offered a new source of revenue. According to the "Lancet," however, "a few years' experience has unfortunately brought about no small disillusionment. The owners of carriages complain of the destructive action of the salt mud on the varnish and paint; and the tradesmen complain of the injury inflicted on goods of all kinds by the salt dust and its subsequent deliquescence. Lastly, the users themselves have discovered that the salt water exerts such a corrosive and generally destructive action on metal pipes and fittings, that the number of persons contracting for a domestic supply has fallen from 200 to 2, and the leakage from the joints of the street mains has caused the deaths of the trees planted in the best streets and promenades; so that the Engineer to the Corporation that had been the pioneer in the movement finds himself compelled to admit that the system has proved a complete failure."

APPLICATIONS FOR LETTERS PATENT.

20,784.—Henshaw, C. T. A., "Gas-tap with bye pass for inverted incandescent burners." Sept. 28.
20,786.—Thomson, J., "Incandescent burners." Sept. 28.
20,797.—Woltereck, H. C., "Production of ammonia. Sept. 28.
20,802.—Gillespie, A. L., "Flame-lowering device for gas cooking-ovens." Sept. 28.
20,833.—Grosse, G., "Gas cooking-stoves." Sept. 28.
20,850.—Cerasoli, A., "Gas-producers." Sept. 28.
20,868.—Tweedale, E. & S., and Smalley, J., "Cooling and purifying producer gases." Sept. 29.
20,877.—Manders, W. R., "Incandescent gas-lamps." Sept. 29.
20,896.—Childs, C. V., "Gas or oil engines." Sept. 29.
20,927.—Betts, L. F., "Gas-burners for heating and lighting." Sept. 29.
20,930.—Harris, A. E., "Atmospheric gas-burners." Sept. 29.
20,953.—Thorp, T., "Fluid meters." Sept. 30.
20,966.—Lines, A., "Burner for acetylene and other high illuminating power gases." Sept. 30.
20,968.—Lanchester, F. W., "Gas and oil engines." Sept. 30.
21,041.—Beel, R., "Regulating the consumption of gas." Sept. 30.
21,042.—Best, R. H., "Gas or oil lamps." Oct. 1.
21,099.—Potter, W. G., "Incandescent gas-burners." Oct. 1.
21,148.—Murray, T. R., "Gas or oil engines." Oct. 2.
21,149.—Crossley, W. J., and Rigby, T., "Gas-producers." Oct. 2.
21,151.—Johnson, G. E. O., "Anti-vibratory incandescent gas-pendant." Oct. 2.
21,162.—Chandler, S. & J., and Sheldrake, J. H., "High-pressure incandescent gas lighting." Oct. 2.
21,221.—Joyner, T., "Intensifying the incandescent light." Oct. 3.
21,228.—Lanchester, F. W., "Internal combustion engines." Oct. 3.
21,229.—Lanchester, F. W., "Gas and oil engines." Oct. 3.
21,237.—Richardson, H., "Gas-engines." Oct. 3.
21,257-8.—Attenborough, E., "Incandescent gas-burners." Oct. 3.

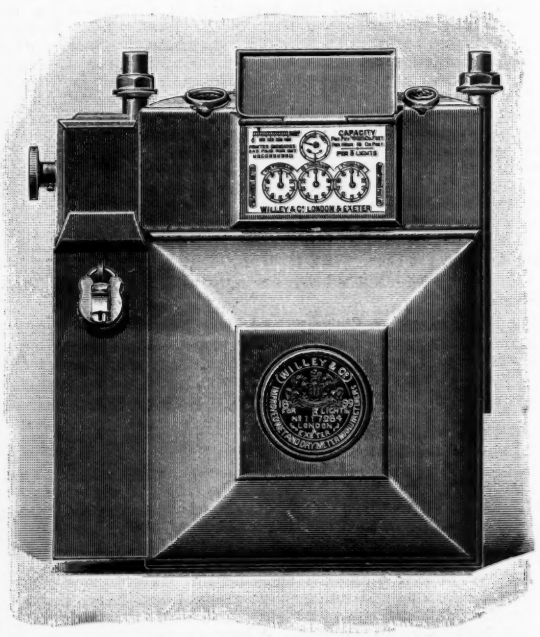
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LONDON AND EXETER.

The Hellifield Gas Company have placed the order with Messrs. R. Dempster and Sons, of Elland, for a steel tank and gasholder.

Messrs. Joseph Taylor and Co. have in hand a double detachable ammonia pipe and detachable acid pipe saturator for the Ramsgate Corporation Gas Department.

Our readers may remember that the publication of the "Journal of Acetylene Gas Lighting," the official organ of the Acetylene Association of Great Britain, was discontinued some time ago. A successor, bearing the simple title of "Acetylene," has now been started, and will be published monthly by Messrs. Raggett and Co., London, at the price of 3d. The opening article contains some interesting comparisons, from the point of view of cost, between acetylene and coal gas; and it is acknowledged that if the latter is burned economically, its young rival cannot possibly compete with it.

The Conservative Association of Byron Ward, Nottingham, held a meeting on Thursday for the purpose of asking the retiring councillor for the ward—Mr. C. W. Milner, M.R.C.S.—to seek re-election next month. In thanking the Association for the honour they had done him, Mr. Milner referred to the work of the Gas Department of the Corporation; remarking that the Gas Committee had been prominently before the public. He said there had been a great deal of mud-throwing, both justly and unjustly; but at any rate he could safely say there had been a great improvement upon three years ago. At that time the then Gas Manager was in a very poor state of health; and he had always regarded Mr. Chester's death as being due in a great measure to overwork. The expert report on the matter showed that for the work to be carried out properly they ought to have both an Engineer and a Manager. They had lately lowered the illuminating power of the gas from 17 to 14 candles "for the purpose of making the public use the incandescent form of lighting;" and the Corporation were once even thinking of supplying the mantles. But he and others had succeeded in putting a stop to this; for he did not believe in the Corporation being turned into a huge trading concern.

The gas sold by the Natural Gas Fields of England during the past quarter is stated to have amounted to 277,000 cubic feet, as compared with 110,000 cubic feet in the previous quarter.

The report for the year ending Aug. 31, of the Glenboig Union Fire-Clay Company, Limited, shows that the sum at the credit of the profit and loss account (including the balance of £1056 brought forward) is £25,612, from which there has been written off for depreciation £5000; leaving a net profit of £20,612. From this sum it is proposed to pay a dividend of 10 per cent., amounting to £13,500 (less income-tax of 11d. in the pound), and to place £5000 to the reserve account, making the reserve fund £15,000, and leaving £2112 to be carried forward.

We learn that Messrs. J. Firth Blakeley and Co., of Thornhill, Dewsbury, have recently completed a new steel tank, 31 ft. 6 in. diameter and 12 feet deep, for the Doune (N.B.) Gas-Works, in which they are also erecting a gasholder. They have also made a similar tank, 51 ft. 6 in. diameter and 16 feet deep, which they are commencing to erect, in connection with a 50 ft. by 16 ft. holder, at the gas-works at Emsworth, near Portsmouth, under the supervision of the Company's Engineer (Mr. N. S. Church, of Chichester). They have at present in hand for the Okehampton Gas-Works a new steel tank and gasholder, 40 feet in diameter and 14 feet deep; and a set of six of their new patent rectangular condensers, 20 feet high, with 12-inch valves and connections, for the Sedgley Gas Company. The firm have recently erected two 20 feet square purifiers for the Willenhall Gas Company, and are proceeding with four 15 feet square boxes, with new hydraulic lifting apparatus, &c., for the Alva (N.B.) Gas-Works, under the superintendence of the Engineer (Mr. W. Chalmers). In addition to these and some minor contracts, they have secured an order for all the apparatus for entirely new gas-works at Shotts, near Glasgow. They are now erecting a new scrubber at Mildenhall, and have lately completed two retort-beds and a set of four 12 feet square purifiers at Wallingford.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CLERK IN LARGE GAS-WORKS. No. 4109
BOOK-KEEPER. No. 4108.
WORKING MANAGER. Cricklade Gas-Works.
GAS-FITTER, MAIN, AND SERVICE LAYER. Brecon Gas Company.
GAS-FITTER. Uttoxeter Gas-Works.
GAS-FITTERS. Birmingham Gas Department.
HANDY MAN. No. 4101.
STOKERS. Sunbury-on-Thames Gas-Works.

Situations Wanted.

ASSISTANT TO WORKING MANAGER. Williams, Cleobury Mortimer
DRAUGHTSMAN, CLERK OF WORKS, &c. No. 4107.
POSITION IN GAS-WORKS OR REPRESENTATIVE OF MANUFACTURER. No. 4105.
REPRESENTATIVE OF LIGHTING APPLIANCE FIRM. "G. 94," care of Smith's, Manchester.
SHOW-ROOM MANAGER, &c. No. 4110.
SHOW-ROOM MANAGER, &c. R. B., Peckham Rye.

Gas Manufacture Correspondence Classes.

No. 4103.

Plant for Sale.

COMPLETE GAS-WORKS PLANT. Sir Titus Salt, Bart., and Sons, Saltaire.

Plant Wanted.

BAR PHOTOMETER. No. 4106.

Meeting of Company.

IMPERIAL CONTINENTAL GAS ASSOCIATION. London, Nov. 3, 2.30 o'clock.

Sales of Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. Oct. 27.
BARKING GAS COMPANY. Oct. 20.
CROYDON GAS COMPANY. Oct. 27.
GRAYS GAS COMPANY. Oct. 27.
GREAT YARMOUTH WATER-WORKS COMPANY. Oct 20.
HARROW AND STANMORE GAS COMPANY. Oct. 20.
ROMFORD GAS COMPANY. Oct. 20.
SOUTHEND GAS COMPANY. Oct. 20.
SOUTH ESSEX WATER COMPANY. Oct. 27.
WELLINGBOROUGH GAS COMPANY. Oct. 28.

TENDERS FOR

Buildings, &c.

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

Fire-Clay Goods.

CHELTENHAM GAS COMPANY. Tenders by Oct. 20.
SHEFFIELD GAS COMPANY. Tenders by Oct. 31.

Oxide of Iron.

MANCHESTER GAS DEPARTMENT. Tenders by Oct. 22.

Pipes and Pipe Laying.

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

Reservoir (Covered).

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half-Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 5s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.
(Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL, 5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

WANTED, by a Middle-Aged Man, the MANAGEMENT of a Gas Company's Show-Room, and to Superintend Fitters.

Address R. B., 95, PECKHAM RYE, S.E.

GAS-LIGHTING Engineer, Educated, Good Address, is desirous of representing a Firm with Lighting Appliances and Specialities. Manchester and District. Has travelled and attended Exhibitions.

For further Particulars, address "G94," care of W. H. SMITH AND SON, Advertising Agents, MANCHESTER.

WANTED, by a Young Man, a Situation as ASSISTANT to a Working Manager. Has had 18 Months' Experience in the routine of a Gas-Works. Used to Stoking, Purification, and Lamp Lighting. Good References.

Address G. WILLIAMS, Pinkham, CLEOBURY MORTIMER.

ADVERTISER (Age 36) desires Appointment as SHOW-ROOM MANAGER or similar post. Thoroughly experienced in Gas Cookers, Fires, Fittings, &c. Good Correspondent and Book-keeper. Excellent References.

Address No. 4110, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks an Appointment at a Gas-Works. Has had 19 Years Office Experience as Book-keeper and Secretary. Could Manage a Small Works. Bronze Medalist (City and Guilds Examination, Ordinary Grade). Good Record. Willing to act as Representative of Manufacturers of Gas Plant, &c.

Address No. 4105, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS DRAUGHTSMAN.

GENTLEMAN, who has had good Experience with Gasholder and Boiler Makers, and with firms of Retort Setters, and Conveyor and Elevator people, and Two Years on a large Gas-Works, desires SITUATION as Gas-Works DRAUGHTSMAN, CLERK OF WORKS, or ASSISTANT to Engineer. Age 30.

Address No. 4107, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RE Advertisement for Engine and GENERAL FITTER (No. 4074). Applicants are thanked; the Appointment being now FILLED.

WANTED, a Smart Young Man as GAS-FITTER, MAIN and SERVICE LAYER.

Apply, stating Age, Wages required, &c., to the SECRETARY, Gas-Works, BRECON.

GAS ENGINEERING.

CORRESPONDENCE Tuition in Chemistry, Gas Manufacture, Mechanics, Steam, Electricity, &c., by entirely new method.

Apply, by letter, to No. 4103, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Good Gas-Fitter. Must thoroughly understand Incandescent Burners, Gas Stoves and Fires, and the Laying of Mains and Services. Wages 30s. per week.

Apply, with *copies* of recent Testimonials, to W. MURRAY, Manager, Gas-Works, UTTOXETER.

WANTED, Two Men as Stokers. Used to Engine, Exhauster, Regenerative Furnaces, and Shovel Charging. Wages 35s. per week of seven days, and one week's holiday every year. Permanency to steady Men.

Apply to the MANAGER, Gas-Works, SUNBURY-ON-THAMES.

A WORKING MANAGER Wanted immediately for the Cricklade Gas-Works. Make about 1 million cubic feet per annum. Cottage, Gas, and Fuel free. State Age, References, and Wages required.

Applications to W. SUGG, Secretary, Gas Company, Cricklade, WILTS.

WANTED, for medium-sized Gas-Works near Birmingham, a Handy Man to repair Tools and Machinery. Wages 7d. per hour. Preference given to a Practical Mechanic who has held similar appointment.

Apply, enclosing *copies* of Testimonials, to No. 4101, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOOK-KEEPER Wanted, to keep Gas Accounts in a Westminster Office. Must be competent to draw up Revenue Accounts, &c., to parliamentary model. Starting Salary £80 to £120, according to Ability and Experience.

Apply, in own writing, on the 28th inst., stating Age (not to be over 30), Experience, and Salary expected, to No. 4108, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Smart, Intelligent Clerk for General Manager's Office in a large Corporation Gas-Works. Applicants must have had Experience in General Accounts, and be capable of undertaking Statistical Work. Speed and accuracy with figures indispensable. A knowledge of Shorthand desirable.

Applications, stating Age, Experience, and Salary required, to be sent in not later than the 27th of October, to No. 4109, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

GAS-FITTERS WANTED.

APPLICANTS, under 40 years of age, must be fully qualified, used to fixing Wet Meters, and accustomed to all classes of Compo. and Iron pipe work, Stoves and Chandelier fixing. Sample Meter Joints must be made by Applicants prior to engagement. Permanent employment for suitable men. Wages 8d. per hour, rising to 8½d. at the end of Three Months if work and conduct are satisfactory.

Apply, with *copies* of Two recent Testimonials, to GAS-FITTINGS DEPARTMENT, Council House, BIRMINGHAM.

TAR Contracts Wanted on the Sliding-Sca'e or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

TO BE SOLD—Gas Valves (Six Screw) by Walker, 16 in. diameter; also Six RACK and PINION, by Donkin, same size. Equal to new.

GASHOLDER, 22 feet by 10 feet, with Steel Tank. Self contained.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

MODERN GAS PLANT.

FOR SALE BY TENDER.

COMPLETE Gas-Works Plant to make about 30 Millions annually.

HYDRAULIC MAINS and FITTINGS by Messrs. W. C. Holmes and Co.

Four PURIFIERS, 13 ft. 4 in. by 9 ft., and Centre-Valve for same.

One Laycock and Clapham's Patent "Eclipse" WASHER-SCRUBBER.

One Clapham's Patent "Eclipse" Slow-speed CONDENSER.

One Gwynne and Beale's Patent GAS EXHAUSTER, together with Horizontal Engine on same bed-plate, and fitted with Inlet, Outlet, and Bye-pass Valves.

One New Three-Lift GASHOLDER, 60 ft. 6 in. by 18 ft. deep each lift, on Gadd and Mason's patent principle, without Guide-Framing.

One Single-Lift GASHOLDER, 60 feet by 18 feet deep.

Also VALVES, PIPES, and CONNECTIONS.

The whole of the Plant is in first-rate condition, and can be seen by Appointment.

Sir TITUS SALT, Bart., SONS, and Co., Limited, Saltaire, YORKSHIRE.

PHOTOMETER.

WANTED, a Second-Hand Bar Photo-METER.

State (by letter) Price and Particulars as to Type, Maker, Age, and Condition to No. 4106, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS, WATER, AND STEAM TUBES AND FITTINGS.

A QUANTITY of all Sizes to dispose of cheap. Standard Whitworth sizes. High Grade. Made by a First-Class Firm. State requirements; price will be sent. Approval anywhere, carriage paid.

BERNARD CARLYLE, Oldbury Road, SMETHWICK.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD Cheap:—

Two (18 inch) SQUARE STATION METERS, new drums.

TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.

Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."

EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.

CONDENSERS, RETORT IRONWORK, GASHOLDERS, STEEL TANKS.

Every description of New and Second-Hand Gas Plant made and supplied.

Inquiries solicited by J. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

CHELTENHAM GASLIGHT AND COKE COMPANY.

FIRE-BRICKS, &c.

TENDERS are invited for the supply of FIRE-BRICKS, ARCH BLOCKS, and FIRE-CLAY.

Specification of Quantities may be obtained from the undersigned, to whom Tenders must be delivered on or before the 20th inst.

The lowest or any Tender will not necessarily be accepted.

R. O. PATERSON,
Engineer.

Gas-Works, Cheltenham,
Oct. 3, 1903.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of SILICA and FIRE-CLAY GOODS, required at their Neepsend, Effingham Street, and Grimesthorpe Stations, during the next Twelve Months.

Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. J. W. Morrison, on and after Oct. 15, 1903.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Tender for Fire-Clay Goods," must be delivered by post to the undersigned not later than the first post on Saturday, Oct. 31.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Oct. 8, 1903.

MANCHESTER CORPORATION GAS-WORKS.

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply of 1500 Tons of OXIDE OF IRON Purifying Material at their Gaythorn, Rochdale Road, and Bradford Road Works during the ensuing Twelve Months (moisture not to exceed 35 per cent.).

Sealed Tenders, endorsed "Oxide of Iron," addressed to the Chairman of the Gas Committee, must be delivered at the Offices of the Gas Department, Town Hall, Manchester, not later than Ten a.m. on Thursday, the 22nd of October, 1903.

WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Oct. 9, 1903.

THAMES VALLEY AND GORING WATER AND GAS COMPANY, LIMITED.

WATER-SUPPLY EXTENSIONS.

CONTRACT No. 4.

COVERED HIGH-SERVICE RESERVOIR AND 12 MILES OF DISTRIBUTING-MAINS.

THE Directors are prepared to receive TENDERS for the construction of a COVERED HIGH-SERVICE RESERVOIR, Superintendent's HOUSE and OFFICES, FITTERS' SHOP, BOUNDARY WALL and FENCE, Road Making, and the Supplying, Hauling, and Laying of about 12 miles of Distributing MAINS, in accordance with Plans and Specifications prepared by their Engineer, Mr. George H. Robus, Mansion House Chambers, London, E.C., where Plans may be seen in Room 339, between the hours of 11 and One o'clock any day from Oct. 7 to Oct. 21, and copies of Specification obtained upon deposit of £3 3s., which will be returned upon receipt of *bond-fide* Tender.

The Engineer will be in attendance at the Reservoir Site, Woodcote, near Reading, on Wednesday, Oct. 14, at Twelve o'clock, to meet intending contractors.

Sealed Tenders to the Secretary by Ten a.m., Oct. 28.

The Directors reserve the right to accept any Tender.

J. HUNT, Secretary.

Oct. 1, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £13,200 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY LIMITED.

NEW ISSUE OF 650 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BARKING GAS COMPANY.

167 £10 ORDINARY 7 PER CENT. SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GREAT YARMOUTH WATER-WORKS COMPANY.

SALE BY AUCTION OF 500 £10 ORDINARY SHARES,

Ranking for 7 per cent. Dividend, 4 per cent. having been paid on similar Shares in the Company for seven years past. The Company was incorporated fifty years ago, for supplying the important seaport town of Great Yarmouth and its surrounding districts; and to keep pace with the increasing demand for water, this further capital for the construction of new works is required.

The Water-Revenue has risen from £14,226 in 1897 to £18,198 last Year.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots, by Order of the Directors.

Particulars of Sale, with Form of Instructions for the Auctioneer or Secretary to purchase for Investers unable to attend the Auction, obtainable post free of the Secretary of the Company, Great Yarmouth, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
CROYDON COMMERCIAL GAS AND COKE COMPANY.

NEW ISSUE OF £3500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF £9500 (or thereabouts) FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY LIMITED.

NEW ISSUE OF 200 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the MART, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 3rd of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June, 1903, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 20th inst., to the 3rd prox., both days inclusive.

The Dividend will be paid on the 10th of November.

By order of the Board,
ROBERT W. WILSON,
Secretary,

21, Austin Friars, London, E.C.,
Oct. 12, 1903.

SALE OF SHARES.

MESSRS. PENDERED & SON are instructed to offer for SALE BY PUBLIC AUCTION, in Lots, at the Hind Hotel, Wellingborough, on Wednesday, Oct. 28, 1903, at Five for Six o'clock in the evening:—

600 £10 SHARES in the WELLINGBOROUGH GASLIGHT COMPANY, LIMITED.

The Shares will bear Dividend as from the 1st of January, 1904.

The Dividend paid for the last five years on the £10 Shares of the Company has been at the rate of £9 per centum per annum, free from Income-Tax.

Further Particulars may be obtained from the AUCTIONEERS, Mr. S. H. KIMBELL, Secretary to the Company, or from Messrs. SHARMAN, JACKSON, AND ARCHER, Solicitors, all of WELLINGBOROUGH.

JUST OUT. *With Diagrams and Illustrations. Price 5s. net.*

ACETYLENE:
The Principles of its Generation and Use,

By F. H. LEEDS, F.I.C., F.C.S., Member of the Society of Public Analysts and of the Acetylene Association, and W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S., Consulting Chemist, Author of "The Chemistry of Gas Manufacture."

GENERAL CONTENTS.—Introductory—Advantages of Acetylene—Chemistry and Physics—General Principles of Generation—Choice of a Generator—Statutory Regulations—Treatment after Generation—General Properties—Mains and Service-Pipes—Subsidiary Apparatus—Burners—Heating Apparatus and Motors—Carburetted, Compressed, and Dissolved Acetylene—Mixtures—Acetylene Lamps—Valuation and Analysis—Index.

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16, DEANSGATE, MANCHESTER,
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Manufacturers of
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GAS RETORTS,
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PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
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On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

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Gas Companies are solicited to try Samples of the
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"ROTARY"
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Efficiency Demonstrated.
APPLY—
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Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

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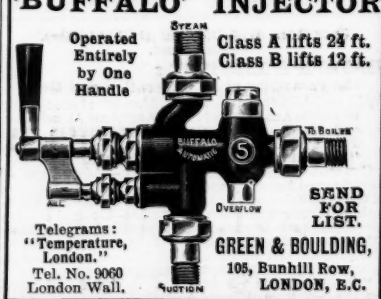

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MANUFACTURERS OF THE WELL-KNOWN
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GAS ENGINEERS
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WARNING.

THE NEW INVERTED INCANDESCENT GAS-LAMP COMPANY, LIMITED, observes the advertisement issued by the "Star" Inverted Incandescent Burner Company, Limited, in the current issue of the "JOURNAL OF GAS LIGHTING."

The advertisement referred to is misleading. Although, it is true that this Company did not press for an Injunction, the reason for that abstention was that the Defendant Company gave an undertaking to keep an account of all burners of the kind complained of, during the pendency of the Action, in order that, in case of success, this Company will be entitled to damages in respect of all such sales.

The advertisement of the Star Company is also misleading, in inferring that, because of the contention by the Star Company that their Burner was no infringement of our Patent Rights, we did not press for an injunction.

This Company has not withdrawn, nor failed in, any of its claims.

The Star Company consented to the Order which his Lordship made, that the account of goods sold should be kept.

With reference to the offer by the Star Inverted Incandescent Burner Company, Limited, to indemnify customers against loss or molestation upon report being made to the Star Company's Solicitor, the trade is cautioned, before accepting such indemnity, to ascertain particulars as to the cash capital of the Company, or other assets available, to make good the indemnity offered.

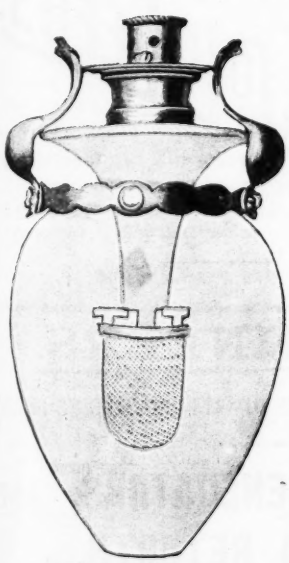
The Star Inverted Incandescent Burner Company, Limited, is a Company which is registered with a nominal Capital of £1000, divided into 1000 shares of £1 each, and so far as can be ascertained from a search of the file kept by the Registrar of Joint Stock Companies, Somerset House, no substantial portion of that capital has been subscribed.

Actions for damages for infringement will be brought against every firm or person who may infringe the rights of the **New Inverted Incandescent Gas Lamp Company, Limited.**

Solicitors to the Company,
Messrs. STEADMAN, VAN PRAAGH, AND GAYLOR,
4, Suffolk Street, Pall Mall East, S.W.

Oct. 8, 1903.

THESE ARE THE GENUINE AND ORIGINAL PATENT INVERTED INCANDESCENT GAS-BURNERS.



One-third full size.
Price: Burner with Mantle, **6/6.**
Globes from **8d.** each.

No. 1 BURNER.

The most up-to-date and economical system of gas lighting, artistic in appearance and absolutely shadowless, and readily attached to existing fittings.

A BRILLIANT WHITE LIGHT OF 65 STANDARD CANDLE POWER.

Gas Consumption only 3 cubic feet per hour.

The decorative appearance of Electric Light at one-tenth the cost.

THE "BIJOU" BURNER

Is the nearest approach to Electric Light, and lends itself more than any other gas-burner to private house lighting, having an exceedingly pretty effect when fixed in clusters of 2, 3, or 5 lights.

20 standard candle power.

Consumption of Gas, 1 foot per hour.

One-third full size.
Price: Burner with Mantle, **4/6.** Globes from **4d.** each.

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SUPPLY FROM STOCK

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SOCKET-PIPES FOR GAS OR WATER PURPOSES.

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Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**

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THE EXPORT MANTLE

SUPPLIED TO **180** GAS COMPANIES.

Illuminating Power 80 to 700 Candles.

EXPORT MANTLES, 27/- PER GROSS.
EXPORT REMA SILK MANTLES.
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Special Quotation for Large Quantities.

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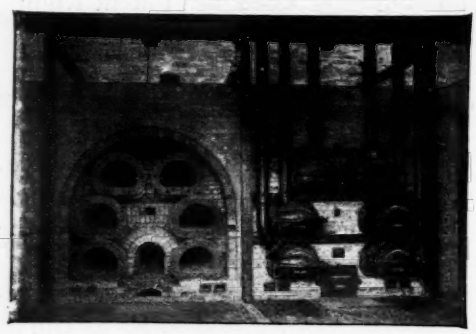

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REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

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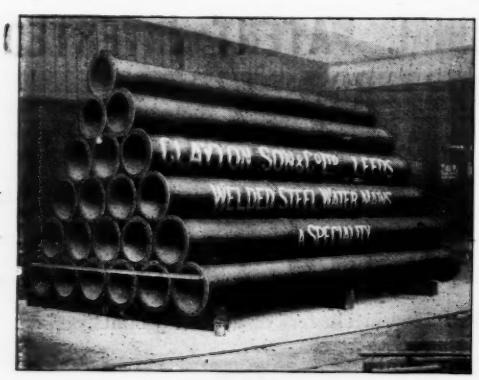

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Messrs. DAISH AND CO., The Peacock, Islington:—

"In reply to yours *re* comparative cost of running your Lucas Lamps as against our recent (electric) installation, the saving is enormous and we have much more light."

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"The gas consumed in the 6 lamps (700 c.p.) is exactly 100 feet per hour, in our case 4d. per hour for a light of 4200 c.p."

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MR. ALBERT ROLLINGS, 9, Pembroke St., Pembroke Dock:—

"A great saving in the cost of gas for the light given."

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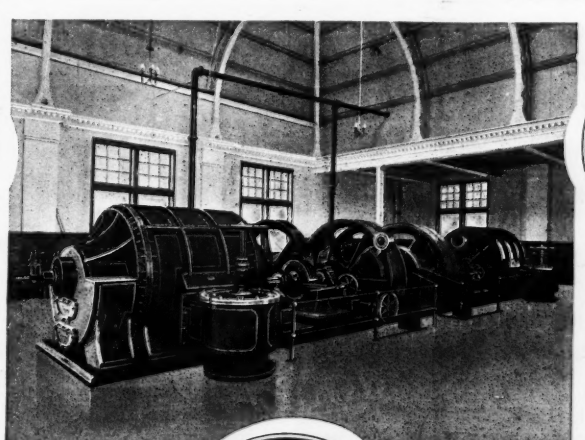

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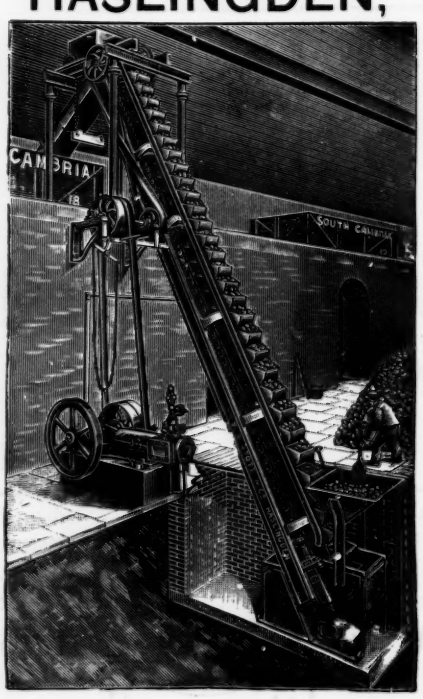

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HIGH-CLASS **STEAM-ENGINES** up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

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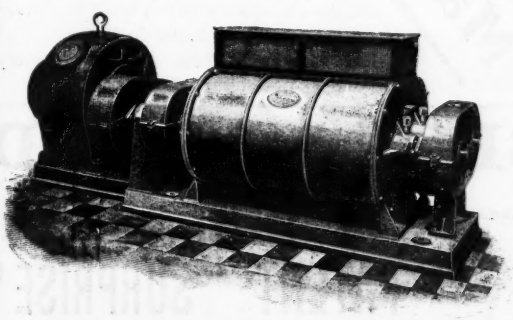
METHANE-HYDROGEN WATER-GAS PLANT.

3 gallons Tar and 20 lbs. Coke produce 1000 cubic feet 10 to 12 Candle Power Gas of the following composition—

Hydrogen	64·4 per cent.
Methane	12·0 „ „
Unsaturated Hydrocarbons	3·0 „ „
Carbon Monoxide	15·0 „ „
Nitrogen and Carbon Dioxide	5·6 „ „
	100·0
Calorific Value	400 B.T.U.

See **Prof. VIVIAN B. LEWES'S** Lecture before Society of Arts, reported in the "JOURNAL OF GAS LIGHTING," Dec. 9, 1902.

THWAITES BROS., LD.,



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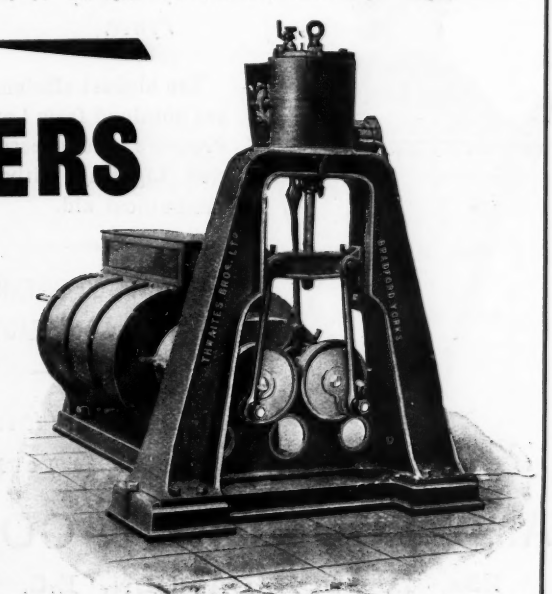

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Driven by Engine, Belt, or Motor.

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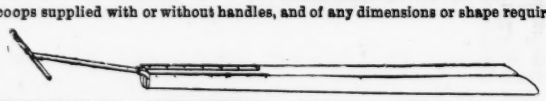

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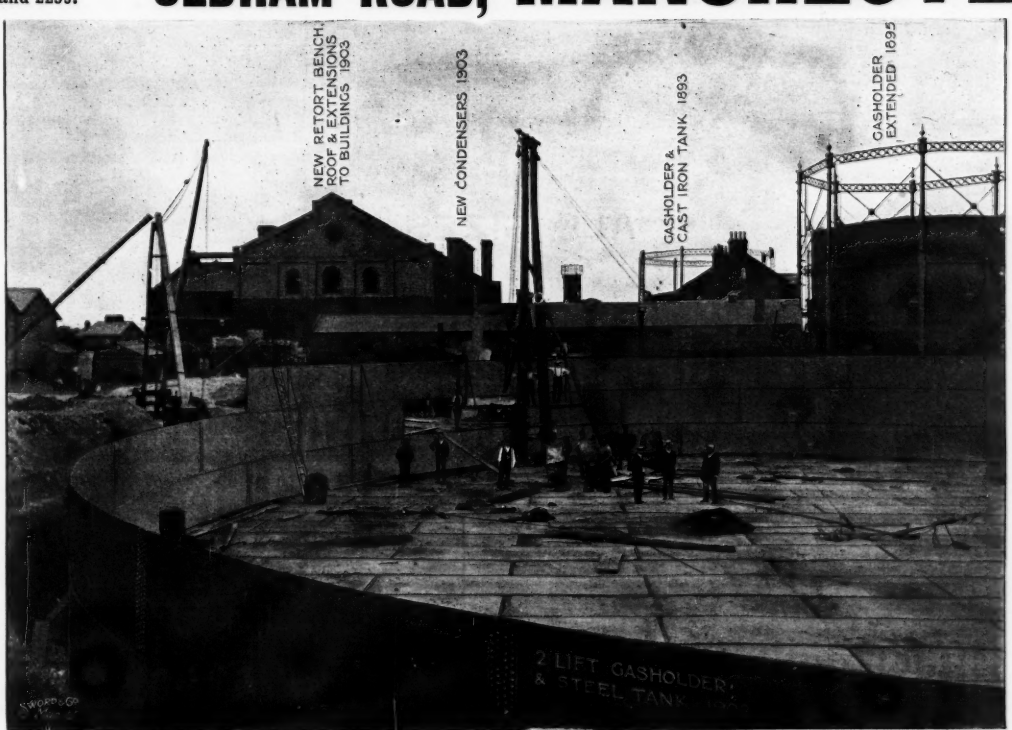
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[See also Advt. p. 88.

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To Messrs. R. Dempster & Sons, Ltd.,
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——	Coal Carbonized.	Coke Sold.	Coke Sold per Ton of Coal Carbonized.
1903.	Tons.	Tons.	Cwt.
JUNE	**507·16**	**291·6**	**11·5**
JULY	**612·10**	**373·3**	**12·2**
AUGUST	**605·14**	**357·1**	**11·8**

The coal carbonized is two-thirds Derbyshire and one-third South Yorkshire. The settings have been used since November, 1902, and, although the beds have been let down and lit up again, I can detect no sign of fractured tubes or short-circuiting of any description.

I shall be glad to give any further information upon hearing from you.

Yours faithfully,
(Signed) G. Stevenson,
Secretary and Manager.

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Printed for Walter King by King, Sell, & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 13, 1903.